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ABSTRACT

From September 1975 to January 1976, two Maryland nature centers were analyzed with regard to their (1) programs and facilities, (2) clientele and potential clientele characteristics, and (3) naturalist staff conceptions and ideas. In four surveys, data were collected to determine critical parameters affecting clientele usage of the facilities, so that recommendations could be made to rectify problem areas. The data indicated that both centers attract a young, highly educated segment of the general population. Many of the non-grouped clientele come to the centers in small family units and are regular visitors. It was also found that nearly all of the grouped clientele consist of preschool through intermediate-aged children. On the basis of the collected data, the recommended actions include: (1) investment of a greater amount of resources in programs and facilities for non-grouped children, (2) acceptance of certain modifications in nature center programs and facilities to attract the elderly, the handicapped, and upper-level academic groups, and (3) alternation of internal and external facilities and programs to comply with standards noted in the literature and clientele requests. (Author/MH)

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A CASE STUDY AND SURVEY OF TWO MONTGOMERY COUNTY, MARYLAND NATURE CENTERS; WITH AN OVERVIEW OF NATURE INTERPRETATION AS A UNIQUE SPECTRUM IN THE EDUCATIONAL PROCESS

by

Loren Wayne Lustig

Master's Problem submitted to the Faculty of the Graduate School
of the University of Maryland in partial fulfillment
of the requirements for the degree of
Master of Science
1976

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DEDICATION

Dedicated to the loving memory of my father

Ervin Albert Lustig

who introduced me to the magnificence of the natural environment. Our love for each other was often expressed in our mutual love and appreciation of God's handiwork.

and

to my wife

Louise Carol

who has been my constant companion, a dauntless supporter, a source of unfailing encouragement. Without her this work would have been impossible.

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ABSTRACT OF RESEARCH SECTION

Title of Master's Problem: A Case Study and Survey of Two Montgomery County, Maryland Nature Centers; With an Overview of Nature Interpretation as a Unique Spectrum in the Educational Process

Loren Wayne Lustig, Master of Science, 1976

Master's Problem directed by: Dr. Emmett L. Wright, Assistant Professor
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From September 1975 to January 1976 two Montgomery County, Maryland nature centers were analyzed with regards to their: (1) programs and facilities (2) clientele and potential clientele characteristics (3) naturalist staff conceptions and ideas. The author hoped to determine critical parameters affecting clientele usage of the facilities, and thus, ascertain specific recommendations to rectify problem areas. Data pertaining to the above were obtained through the use of four distinct surveys.

Data collected indicate the following. Both nature centers tend to attract a young, highly educated segment of the general population. Many of the non-grouped clientele come to the centers in small family units and are regular visitors. The single most important program/facility appears to be the exhibits at one center (Brookside) and the self-guided nature trail at the other (Meadowside).

Presently, nearly all of the grouped clientele consist of preschool through intermediate aged children. The popularity of the guided building tour among Brookside grouped clientele and the guided nature hike among Meadowside clientele was documented.

The staff apparently feel that grouped users constitute the largest and/or most important segment of the total clientele. Staff generally

have an accurate perception of grouped clientele interests.

On the basis of data collected, the author's recommendations include: (1) investment of a greater amount of resources in programs/facilities for non-grouped clientele (2) acceptance of certain modifications in nature center programs/facilities to attract the elderly, the handicapped, and upper level academic groups (3) alteration of internal and external facilities/programs so as to comply with standards noted in the literature and requests of large segments of the clientele.

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INTRODUCTION

The field of nature interpretation encompasses a multi-faceted discipline, with major areas of concern in the natural sciences, the behavioral sciences and the social sciences. With this in mind, the author has attempted to examine much of the sphere of nature interpretation, including its theoretical rationale and basis for existence, its exemplification in the contemporary locale, and its levels of success as an educational and recreational process. The paper's major sections reflect the following threefold objectives of the author.

1. To gain an overview of nature interpretation not only as an academic discipline but also as an employment profession. The philosophy of, and rationale for, nature interpretation are examined. The programs, facilities and techniques employed in nature centers are discussed.

2. To examine the operations and objectives of a local nature interpretation facility. In this case, the two nature centers (Brookside Nature Center and Meadowside Nature Center) of the Montgomery County, Maryland section of the Maryland-National Capital Park and Planning Commission (M.N.C.P.P.C.) were chosen. Their history, present status, operations and objectives are discussed and, in part, compared to techniques and facilities as noted in the literature or present in other interpretive centers.

3. To develop an instrument to evaluate the programs and facilities of the two Montgomery County nature centers. In this regard, questionnaires were developed as a means of obtaining data from four separate groups either actually or potentially associated with the nature centers in question. These groups are:

A. The general public which utilizes the nature centers.

B. The teachers of preschool, elementary or secondary schools whose classes utilize the nature centers or leaders of extracurricular groups which also utilize the nature centers.

C. The naturalists of the Montgomery County, Maryland (M.N.C.P.P.C.) nature centers.

D. Montgomery County, Maryland residents as actual or potential users of their county supported nature centers.

4. To make specific recommendations for alterations in the facilities and programs of the nature centers which are based on data obtained from the surveys.

AN OVERVIEW OF NATURE INTERPRETATION

Introduction

To clearly delineate the scope and boundaries of this paper, and to introduce the reader to the complexity of the subject, the following definitions have been included. The most straightforward method in this regard seemed to be to present brief quotations from the literature.

Nature. Nature has been vilified and revered for centuries. Until the onset of the age of modern science and mechanization, the actions of nature constituted the dominant force structuring the progression of history. For this paper it would seem appropriate to utilize John Stuart Mill's definition of nature (Mill 1873).

> Nature means the sum of all phenomena, together with the causes which produce them; including not only all that happens, but all that is capable of happening; the unused capabilities of causes being as much a part of the idea of Nature as those which take effect.

Further clarification of this concept, especially in relationship to this paper, is provided by Moorman's (1905) designation of nature as "...all that belongs to the outer world of sense perception which is not man or the immediate work of man."

Interpretation. Throughout this paper, the word interpretation refers to the activities performed by a select professional/paraprofessional class of educators/natural scientists. Their calling is to know nature (have a working knowledge in the natural sciences) and to love nature. Furthermore, they must love people and have a desire to enrich their lives through the transfer of this knowledge of natural history. Cantu (1973) quotes an anonymous National Park Service instructor who summarized this concept by simply stating, "Interpretation is a getting to know and a getting to love." The author feels that interpretation may be best defined by analyzing its objectives. In this regard the following definitions are presented from the literature.

> Interpretation...is the explanation of features, objects, and phenomena in terms that are easily understood.... Using many of the facts concerning natural sciences, an effort will be made [in nature interpretation] to explain the principles of conservation so often heard, but not well understood by the average park visitor (Knudsen 1965).
>
> It [interpretation] is an information service. It is a guiding service. It is an educational service. It is an entertaining service. It is a propaganda service. It is an inspirational service (Edwards 1965).
>
> Interpretation is a process or activity which strives for conception between man and his environment, that conceives being the enlightening knowledge of the environment and the part man plays in it (Mahaffey from Hanna 1974).

J. P. Foley (from Barkley 1975) examined the literature for definitions of "interpretation." He found that from 55 definitions in the literature, a four faceted compilation could be developed. In summary, he stated that interpretation is

> ...a communication program which seeks to: (1) develop a positive attitude towards environmental concerns (2) develop a sympathetic attitude toward National Park values (3) impart an understanding of general ecological concepts (4) inspire interest, excitement, enjoyment and a sense of meaning into the visitor's perception of the environment.

The dean of nature interpretation, Freeman Tilden (1957), defines interpretation as being "...an education activity which aims to reveal meaning and relationships through the use of original objects, by first-hand experience, and by illustrative media, rather than simply to communicate factual information."

There are several disciplines which are closely related to nature interpretation but are beyond the scope of this paper. To clarify the boundaries of this paper, two closely related terms are delineated below.

Environmental Education. Environmental education is an activity carried out under a structured academic program in which attendance and attention by the students are expected and measured. Horn et al. (1969) note that potential fields of learning via this type of educational curricula include language arts, science (biological and physical), mathematics, art, music, recreation, and physical education. Environmental education can occur in and through a nature interpretation facility but invariably it is conducted as a cooperative enterprise with a local elementary or secondary school. The same type of program becomes nature interpretation when the audience is free to modify or terminate the learning experience at any time.

Outdoor Education. Outdoor education is a discipline which stresses the use of field experiences as channels to facilitate exposure to, and learning about, the natural environment. This is usually pursued as a component of outside physical activities and/or education. Gabrielsen and Holtzer (1965) note that it "...provides children with direct learning and living experiences in nature's outdoor setting to supplement the regular school curriculum."

The Philosophy of, and Rationale for, Nature Interpretation

From the dawn of history, man has contended with the forces of nature in an attempt to obtain and insure his sustenance. The usurpation and exploitation of the earth's natural resources were often the key to personal and national financial strength. However, until the onset of the industrial revolution, and more recently the population explosion, the sheer mass of the earth's resources, when combined with the recuperative powers of nature, resulted in a majority of ecosystems which were maintained in a basically pure and environmentally stable condition (Santmire 1970). Prior to the mass urbanization and mechanization of society, man out of necessity maintained close contact with the earth (corroborative discussion in Shomon 1968, Hamblin 1923). Thus, at least vicariously, he knew something of the intricacies of nature, because this knowledge meant life.

Santmire (1970) notes that modern society venerates and idolizes the past, so much of which is rooted in feelings for the earth, the wilderness and the frontiersman's experiences. A poem called "The Peace of Wild Things" carried in a post World War II issue of the New York Times captures this prevailing mystique with nature (Santmire 1970).

> When despair for the world grows in me
> and I wake in the night at the least sound
> in fear of what my life and my children's lives may be,
> I go and lie down where the wood drake
> rests in his beauty on the water, and the great heron feeds.
> I come into the peace of wild things
> who do not tax their lives with forethought
> of grief. I come into the presence of still water.
> And I feel above me the day-blind stars
> waiting with their light. For a time
> I rest in the grace of the world and am free.

These feelings so prevalent in urban America empirically result in an increasing flight to parks and natural areas to obtain a brief respite from the social ills and stresses of city life and to at least subconsciously experience something of the natural life of our forefathers. This activity (outdoor recreation) has received a high priority in leisure time use (corroborative discussion by Shomon 1968, Schmitt 1969). Many of the people so engaged are interested in and/or receptive to the interpretation of the natural environment. In fact, several contemporary observers in the field feel that this activity may form the most important part of their visit to the park. In this regard, Vinal (1926) succinctly states, "Without education our parks become a farce or tragedy."

And what is the loss to our citizenry (especially those from urban areas) when interpretation is not available? Goff (1974) notes that without this type of exposure and education, urban children (whose main experience with nature is often via the television) may think that monkeys (Circopithicus spp.) are in our deciduous woods, crocodiles (Crocodylus spp.) are in our ponds, and elephants (Loxodonta spp. or Elephas spp.) occupy our grassy plains. More subtly but no less tragically, adults without an awareness of the dependence of all life upon the balance of nature may have no qualms about supporting a sanitary landfill of a swamp or bog. The same individuals would probably be outraged at the destruction of a different type of public resource; e.g. a library or school (Shomon 1964, Shomon 1968).

In what way can nature interpretation facilities and personnel be effective in correcting this obvious problem? Aldo Leopold (1952) exclaimed, "It is by common consent a good thing for people to get back to nature. But wherein lies the goodness, and what can done to encourage its pursuit?"

Initially, it is important to note that nature interpretation constitutes a very special type of educational system. It is a synthesis of many of the natural sciences, for it requires knowledge of biology, ecology, geology, chemistry, astronomy, etc. Yet it is not a pure science, for of critical importance is the dissemination of practical information in this regard to the layman, and that in understandable and meaningful terms. Thus, nature interpretation must find its legitimate niche not solely in the natural sciences, nor totally in the behavioral and communicative realm, but rather somewhere in the middle. Cantu (1973) notes that "...the interpreter stands between the biologists...on one hand and translates into clear and understandable words the language of the land...to the 'common man' standing on the other side" (corroborative discussion by Coulter et al. 1909, Moorman 1905, Tilden 1957).

The literature deals extensively with the potential benefits of nature interpretation to the clientele. These generally fall into three categories: (1) psychological benefits to the clientele (2) recreational/physical benefits to the clientele and (3) educational benefits to the clientele. The following outline presents these categories along with a short discussion of each.

Psychological Conditioning of the Clientele. Nature interpreters are in a sense behavioral conditioners, for part of their task is to stimulate specific psychological reactions in their clientele. Nature interpretation attempts to provide a "real and vivid" experience with the natural world (Tilden 1957). Comstock (1918) and Green (1926) note that this includes an appreciation of form, structure, color and beauty in the natural world. This is especially important with children, for their imaginations can be cultivated and stimulated as to the realms of nature beyond the present empirical base. Additionally, nature interpretation must create and culture an inner spirit which is enriched through the experience with nature (Tilden 1957). Inherent in this concept is the creation of a feeling of security and companionship with nature, something of great importance when one considers mankind's ultimate dependence upon the interrelationships and structure of the environment (Green 1926).

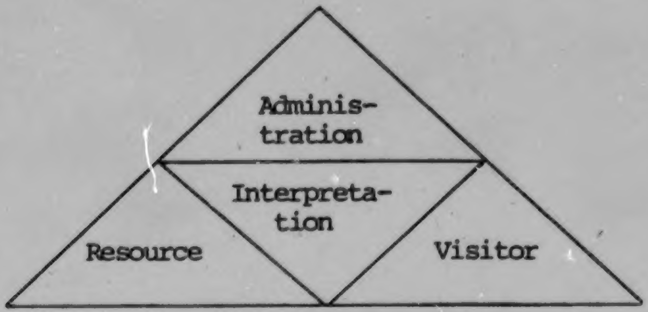
Requisite to this goal of extended or long-range psychological alteration is provocation. Tilden (1957), in fact, considers this to be the chief aim of interpretation. What is provocation? Cornwell and Holcomb (1966) describe provocation as a technique wherein the interpreter introduces his clientele to the intricacies of nature in such a way that interest is aroused and further exposure will be sought.

The ultimate result of this psychological conditioning can be summarized into a threefold objective: (1) to develop a love and appreciation for nature (Russell 1960, National Park Service 1954) (2) to provide for the enrichment of the human spirit (Tilden 1957) and (3) to stimulate curiosity and interest (Tilden 1957).

Recreational/Physical Benefits to the Clientele. In considering the recreational/physical benefits of nature interpretation to the clientele, it is important to note that Americans are being presented with more and more recreational time to dispose of as the work week shrinks (Harris 1970, New York State Parks and Recreation 1972). Several authorities (Tilden 1957, Shomon 1968, the American Association for Health, Physical Education, and Recreation 1963) note that nature interpretation offers a unique opportunity to utilize recreational time blocks with physically, psychologically and educationally enriching experiences. Furthermore, in many instances, nature centers provide the information needed and corresponding facilities for extended constructive use of the recreational areas (Michigan State Park System n.d.*, Kihlmire n.d.). Fischer (1966) notes that interpretation occupies a key position in park operations. He states

> The resource's material [of the park] influences the kind of interpretive media presented to the visitor, while the visitor market influences the level and cycle of the interpretive media. Finally, the administration influences the content of the program because of the need to amplify certain management objectives. The interpretive program also influences the visitor and the administration by facilitating a flow of understanding between them.

He supplied the below diagram to illustrate this concept.



What nature interpretation offers, therefore, is a novel and varied recreational experience which in many cases is almost totally foreign to the routines of the daily lives of the clientele (Tilden 1957).

Educational Benefits to the Clientele. Huxley (from Hodge 1902), in one of his science and education essays, stipulated the guiding principle of education in the following statement.

---

* n.d. denotes that no date is given for the manuscript

> No educational system can have any claim to permanence unless it recognizes the truth that education has two great ends to which everything else must be subordinated. The one of these is to increase knowledge; the other is to develop the love of right and the hatred of wrong.

This principle sets forth a challenge to nature interpreters as well as to other types of educators. Nature interpretation must have a twofold educational objective. First, it must present accurate and meaningful information to the clientele concerning natural history. In this regard, nature interpretation often provides the background or foundation for a structure of higher learning in the natural sciences (National Park Service 1954, Ashbaugh and Kordish 1971). For example, one inherent goal of nature interpretation is the development and cultivation of accurate, systematic observation techniques in the clientele (Brown 1972, Coulter et al. 1909, Green 1926, Comstock 1918). Secondly, nature interpretation must attempt to develop in the clientele what the American Association for Health, Physical Education, and Recreation (1963) calls a "conservation ethic" (corroborative discussion by Knudsen 1965, Brown 1972, Shomon 1975, Bryant 1960, National Park Service 1954, Callison from Shomon 1968). This is born from a multi-faceted process which includes: (1) presenting the facts of natural history and the intricacies of the natural world (2) challenging the clientele to preserve and sustain our natural areas and natural heritage and (3) allowing the beauty of nature to speak for itself.

The ultimate desire in this regard is to create or nurture a mentality which acknowledges the dependency of all life upon the stability of the environment and the elemental responsibility of man to protect, manage, and wisely use the earth and its resources. This is a "conservation ethic."

In summary, the value of nature interpretation appears to hinge on the concise and meaningful development of perception in a citizenry which may or may not be aware that the educational process is going on. The necessity for nature interpretation stems from the wide gulf which has arisen between urban man and a true affinity with the natural world. Inherent in the rectification of the resulting problems is the concept that knowledge is the key to involvement and concern for any issue (Hodge 1902, Russell 1960). In this respect, Ashbaugh and Kordish (1971) note that

> The first step in the interpretive process is to arouse the interest of the visitor. With interest aroused, he becomes receptive to further learning and more knowledge. Knowledge will beget understanding, which leads in turn to appreciation. The end result is the development of new sound conservation attitudes.

Nature Interpretation Programs and Facilities

Introduction

Success in any nature interpretation program appears to rest upon two factors: (1) the facilities and programs available for use and (2) the techniques employed by, and general level of expertise of, the nature interpreters. This section of the text deals with the former, that being the "tools of the trade" which have been devised or have evolved into usage.

The facilities and programs of nature interpretation are housed in, or radiate from, the nature center. Thus, at this point it would be well to define and describe what a nature center is. Shomon (1975) notes that a nature center is

> ...an area of undeveloped land...having on it the facilities and services designed to conduct community outdoor programs in natural sciences, nature study and appreciation, and conservation.

Ashbaugh (1973) summarizes this concept by noting that a nature center is an educational facility that "...brings land and people together on intimate terms...." Several authors (Knudsen 1965, Thompson 1974b, Kihlmire n.d., Michigan State Park System n.d.) note that a nature center serves its clientele by acquainting them with the parameters of the park or forest (e.g. things to do and see) of which it is a part. In this regard, Thompson (1974b) notes that the nature center should serve a constituent as

> ...a springboard for his venture into the real park story--the landscape...which the park or monument preserves. Having had this preliminary 'briefing,' he (ideally) is made aware of the nature of the experience which he seeks, the best way in which to do it, and a sense of responsibility for maintaining the integrity of the environment.

Ultimately therefore, the goal of the nature center is to help people help themselves in learning about nature.

Interpretive programs and facilities basically fall into two large groupings: those located and/or conducted indoors (at the nature center) and those located and/or conducted outdoors. To a certain extent, these groups can be considered to be independent of each other, but in the total context, they are mutually dependent. This is for two reasons. (1) The ultimate objective is to create an overall knowledge of ecology and a "conservation ethic" in the clientele. This objective requires both indoor and outdoor facilities. (2) As Nutting (1972) notes, some parts of nature interpretation are static or highly predictable (e.g. astronomy or the presence of certain species of trees at specific sites). These segments of the natural world can be interpreted outdoors. Other spheres of natural history are unique or variable in time and space (e.g. the sudden appearance of a mobile vertebrate form) and their interpretation may require facilities beyond the natural habitat.

In this section therefore, the facilities and programs of nature interpretation as noted in the literature and/or observed on scene by the author are delineated and described. The author does not presuppose that the following constitutes an exhaustive list. Furthermore, the success of any particular nature center should not necessarily be judged on the basis of the number and/or types of these facilities which it contains, but rather on the quality of the facilities, their cohesiveness as a total interpretive package, and the technical expertise with which they are employed.

Inside Programs and Facilities

1. Adult Short Courses. An important objective of nature interpretation is to involve adults in the programs and facilities of the center. One method of accomplishing this task is to offer adult level short courses in environmental affairs. These can be taught by members of the naturalist staff or local experts in particular fields of interest. They can be sponsored by the nature center facility itself, by the state extension service, or by a local chapter of a private environmental organization. On site facilities and the immediate presence of the natural environment can stimulate advanced educational endeavors and individual research by the students.

2. Animal Sounds. Animal sounds can form a beautiful background for the entire nature center or for one section of the center. Often a phone booth is used if specific attention is to be drawn to the sounds. The recording can be activated upon the closing of the phone booth door. If the recordings are primarily employed to create an "atmosphere," they may be piped through the entire center. An ideal example of the latter is present at the Rock Creek Nature Center in Washington, D.C.

3. Animals, Living. Professor W. N. Hutt (1905) noted at the turn of the century that "...above all things children find an endless delight in living animals." There is a fascination in observing wild animals at close proximity, especially when a naturalist handles the specimen and points out particular anatomical characteristics. Many nature centers house representative species of lower vertebrates (e.g. reptiles) and some invertebrates as part of their internal exhibits. Especially prevalent are the highly educational and fascinating honey bee (Apis mellifera) hives (Michigan State Park System n.d., Rock Creek Nature Center n.d.). The

general concensus of opinion both in the literature and among local naturalists (personal communication 1975 from W. Nopper, Meadowside Nature Center, Rockville, Maryland; personal communication 1975 from K. Ernst, Brookside Nature Center, Wheaton, Maryland) is that mammalian and avian forms should not be held in captivity due to problems with housing arrangements, and psychological objections by some of the clientele. The opposite opinion was advanced by Stoddard (1969) who noted the success of a small "zoo" at the headquarters of his bobwhite quail (Colinus virginianus) investigation site. The objections to holding the higher animal forms in captivity may be neutralized when animals are obtained which are tame enough to be handled. The clientele under these circumstances are presented with a rare opportunity to see and perhaps touch a representative of a normally wild species at close range.

4. Animals, Living and Apparently Unrestrained. The author observed one case of this kind of exhibit, that being at the Rock Creek Nature Center in Washington, D.C. There a live barred owl (Strix varia) was provided with several old snags upon which to perch. The limits of the owl's "invisible cage" were denoted by a rope at a child's height level. This type of exhibit provides a very exciting and personal exposure to the animal form.

5. Animals, Mounted. Often nature centers incorporate the use of taxidermy mounts as an inherent part of their interior exhibits. Thompson (1974b) notes that if these specimens are representative of the local fauna and are perhaps limited in distribution, they may provide the most effective central theme to the exhibit room. However, the Michigan State Park System (n.d.) cautions that the specimens should not be intended to stand alone, but should be an inherent part of a more complex interpretive presentation.

6. Discussion, Science Round Table. This nature center program is similar to the guest lecture series (#11). However, the round table discussion allows for interplay and dialogue between the participants and the group leader/resident scientist.

7. Exhibits, Regular. Invariably nature centers have indoor exhibits which portray or otherwise denote aspects of natural and human history which may be difficult to observe in the outdoors (e.g. the geological structure of the earth, seclusive and/or poisonous reptiles, etc.) or which involve a more complicated learning procedure (e.g. meteorology). Mahaffey and Berger (1972) note that an indoor exhibit "...tells, characterizes or classifies, expresses quality, kind, or condition of the object(s) being shown." The objectives of indoor exhibits and displays are twofold: (1) to introduce the clientele to aspects of local natural history and (2) to encourage the clientele to investigate the natural environment in person. Several authorities note that indoor exhibits should be simple, flexible in design, and changed frequently (Ashbaugh and Kordish 1971, Chick 1964, Cherem et al. 1974). The presentation of real objects from nature and especially the interactions between faunal forms can produce a strong and long-lasting impression on the visitor. Recently, electronically controlled exhibits which allow for personal involvement by the clientele have engendered a high level of interest (Wagar 1972a). These often ask questions of the clientele, thus resulting in higher retention levels. Sensory exhibits (especially tactile, taste and smell) are also popular and quite prevalent. Taken as a conglomerate whole, the nature center exhibits should attempt to tell the entire park story, dealing with natural and human history and the spheres radiating from them (corroborative

discussion from Michigan State Park System n.d.).

8. Films. Several investigators have noted the importance which movies can play in the nature center interpretive package. For example, Thompson (1974b) felt that they "...get the message across far better than the standard exhibit sequences." Wagar (1972b) similarly found that films were associated with the highest interest levels in clientele. Cantu (1973) notes that there are two basic types of films which nature centers can present, one being a mood setting, emotional type and the other being a more factual, informative type. In either case, the film may not be able to stand alone, but will perhaps require some personal comments by the resident naturalist to summarize the contents of the film and answer questions.

9. Handicapped, Special Courses and Activities for the Physically and Mentally. In the past few years, many nature centers have assumed that their public responsibilities extend to the physically and mentally handicapped, people who may have a great deal of leisure time. To facilitate use by the physically handicapped, the structure of the center should be modified accordingly (e.g. ramps to the entrance, special sensory exhibits, etc.). One example noted by Shugrue et al. (1968) was the construction of a three-dimensional topographical scale model of the local nature trail. The mock-up gives sightless people an opportunity to gain a "feel for the lay of the land." Similarly, the mentally handicapped require interpretive programs which should be modified to meet their unique needs.

10. Hobby Clubs. Nature centers often provide the required facilities and occasionally the leadership for special hobby groups which in some way relate to natural and/or human history. Often these groups can

assist the nature center personnel by creating exhibits dealing with their particular interest.

11. Lectures. Calder (1973) notes that one important function of interpretive centers is the dissemination of knowledge about natural history to the general public. One technique for accomplishing this is to have quest lecturers (e.g. scientists from a local university) present a lecture or series of lectures on their particular field of expertise. The author found only one description of such a program in the literature, that coming from the Cleveland Metropolitan Park Authority (Wallin 1974) which conducted a series of five Sunday morning science lectures with assistance from Cleveland State University personnel.

12. Library. Many nature centers provide on site libraries which deal with the natural and human history of the local area. Nickelsburg (1960) notes the progression of events in nature study as being observation leading to discussion leading to research. An on site library could be of great assistance in meeting the needs associated with this educational progression.

13. Literature, Free Interpretive. Many nature centers publish (sometimes through their parent organization) interpretive literature which usually deals with the local flora and fauna of the area. This material is often available for free distribution. Cantu (1973) notes the success of this technique (here using a "weekly newsletter") in Yosemite National Park.

14. Maple Sugar Making. Any nature center which is fortunate enough to have large sugar maple (Acer saccharum) trees and a climate which features sudden warming trends in the spring should avail itself

of the wonderful tradition of boiling down sugar maple sap. It will provide one of the most appealing sensory exhibits possible. The delicious aroma envelops everyone in the building and is in itself probably a valuable, and certainly unique, interpretive entity. Shomon (1968) notes the pursuit of this activity at the Aullwood Children's Farm, Dayton, Ohio. In addition, the practice was observed by the author at the Wheaton College greenhouse and gardens, Wheaton, Illinois.

15. Message Repeaters. In many interpretive situations, an audio message of short duration would be more effective than a written message. Furthermore, an audio message will present a more personal touch than a written one, and thus, the attention span of the observer will be significantly lengthened (Michigan State Park System n.d., Mahaffey 1970). These messages (when controlled electronically) can be repeated at prescribed intervals or when desired by the clientele.

16. Murals, Enlarged Photographs, and Scenic Pictures. Many nature centers utilize enlarged photographs, murals, and scenic pictures to vividly portray particular aspects of natural or human history. These are especially effective when used in conjunction with controlled lighting which can direct visitor attention to specific highlights. Schmucker (1911) notes that these displays are particularly valuable in preparing the public for empirical outdoor observations. Wagar (1972b) found, however, that these types of displays obtained the lowest levels of clientele interest for inside exhibits.

17. Museum, Living. Mahaffey and Berger (1972) note that a living museum is "A facility in which the exhibits and displays are either alive or dynamic in nature, changing with the time of day, months, season or year."

18. Planetarium. An extremely valuable, but often financially unattainable addition to a nature center is a planetarium. A potential

means of overcoming the problem of cost lies in establishing a quasi-relationship between the nature center facility and a local planetarium. In reference to its value as an "inside facility," Chick (1964) notes that it is one of the most popular features at the Rock Creek Nature Center in Washington, D.C. A similar situation exists at the Bays Mountain Nature Preserve in Kingsport, Tennessee (Murray 1975).

19. Question/Answer Electronic Devices. A special type of internal nature center exhibit is the question/answer exhibit which rewards the participating person with an electronic signal to denote a correct response to an ecology related question. These devices, with certain limitations, can also delineate areas which need clarification (as indicated by a high percentage of incorrect responses) and those areas which are covered adequately (as denoted by a high percentage of correct responses).

20. Slide Presentation, Push Button. Many nature centers are utilizing slide presentations which the visitor activates himself. The slides may have either a written subheading or they may be coordinated with an audio script. Usually, the presentation is short (10-25 slides) and deals with one concept or subject only.

21. Slide/Tape Presentation. An improvement over a simple slide program is a slide/tape presentation in which an audio tape is coordinated with a complicated visual presentation, utilizing multiple projectors. These programs require, of course, very sophisticated electronic equipment and some expertise in their operation. Cantu (1973) notes that these types of shows are especially popular with youth groups.

22. Slides. The captioned slide presentation can be effective for simple interpretive messages or for germane information concerning the

local area. The attention of, and retention by, the clientele will be significantly increased through the use of some type of coordinated audio system (Michigan State Park System n.d., Thompson 1974b).

23. Specimen Study Collections. Specimen mounts of the flora and fauna of the local area can be collected and utilized for advanced interpretive and educational programs. However, their use in general interpretation may be limited since frequently they may be incompatible with the overall theme of the presentation. When used, they should not be expected to stand alone, but rather should be one component of a more complex presentation (Michigan State Park System n.d.).

24. Television, Closed Circuit. A recently devised technique (Barkley 1971) is to use a closed circuit television to record events in the natural environment for live transmission inside the center. Edwards (1971) notes that this technique is an ideal way to bridge the gap between the indoors and outdoors. For example, the camera could be centered on a bird's nest, an outdoor feeder, etc.

25. Trails, Indoors. Many nature centers, especially rural life centers, contain "indoor trails" (Ashbaugh and Kordish 1971). Although these are not defined in the literature, the author notes that they constitute a configuration of interpretive exhibits so arranged that the clientele will follow specific pathways through the building, and thus, they will be exposed to interpretive devices and presentations in a pre-arranged sequence.

26. Workshops. Nature center facilities and personnel can sponsor weekend or evening workshops designed to present extended talks on unique subjects (e.g. how to create wildlife mini-habitats on suburban residential lots). Additionally, introductions into psychomotor or

related skills (e.g. handling of snakes, or identification of wildflowers) can be presented.

Outside Programs and Facilities

Introduction. Perhaps the fundamental objective of nature interpretation is to stimulate people to experience and appreciate the natural world. The optimum site for this educational process is, of course, the out-of-doors. The integration of outdoor programs and facilities into the total nature interpretation package assumes great significance in light of the decreasing affinity with the natural environment on the part of a majority of urban/suburban Americans. Furthermore, outdoor experiences tend to summarize and solidify the facets of natural history that are presented in an interpretive package into a unified concept, that being the wholeness of the ecological picture. Tilden (1957) corroborates this idea by stating

> It is far better that the visitor to a preserved area...should leave with one or more whole pictures in his mind than with a melange of information that leaves him in doubt as to why the area is preserved at all.

Below is presented a list (not intended to be inclusive) of nature interpretation programs, facilities and exhibits for use in the out-of-doors, along with a short descriptive statement concerning each one.

1. Amphitheater Talks. Amphitheater talks are similar to campfire programs (#4) in that they are presentations conducted out of doors but different in that they do not involve as much audience participation. An amphitheater talk is usually presented to a moderate to large audience and can be conducted either during the day or early evening.

2. Animal Tracks. Animals which leave tracks, especially mammals, are often difficult to observe in their natural environment. Thus, their

tracks take on special significance for they denote the fairly recent presence of the animal at the site. To help visitors become familiar with animal tracks, Ashbaugh and Kordish (1971) note that concrete imprints of tracks can be made for use near the nature center or at sites where the animal would likely be found. Furthermore, Ashbaugh (1973) notes that the tracks can be coded with stuffed specimens in a nature center to give additional meaning to the exhibit.

3. Bird Hikes. One unique type of naturalist guided hike is the early morning bird hike. This is extraordinary in that the clientele are often well versed in the subject area and the topic of the hike is limited to one objective, that being the observation and description of local avian forms.

4. Campfire Programs. One of the most aesthetically pleasing interpretive programs is an evening campfire program especially if it is preceded by a time of singing and yarn telling. It provides a meditative and relaxed atmosphere for the interpretive message to follow, whether it be a film, a slide presentation, or a simple talk. The Michigan State Park System (n.d.) notes that the evening campfire program

> ...is the middleman between the park visitor and the natural history of the area surrounding him. It should stimulate interest and appreciation and encourage the wise use of these resources. Generally speaking, the evening program is not a complete service in itself—it is merely an introduction to future outdoor pleasure and demeanor. Entertainment is an important tool rather than an objective of the evening program.

5. Campgrounds Naturalist. Field and Wagar (1973) note that "camping is a popular activity and campgrounds are a traditional interpretive site." As such, some nature centers have recently scheduled a naturalist to walk through local campgrounds engaging campers in conversation and delivering short "off the cuff" interpretive messages as the opportunity

arises. This technique has been pursued with some success at the Cleveland Metropolitan Park Authorities (Wallin 1974). They especially focused in on groups that had been issued permits to conduct day camp programs in the parks.

6. Excursions, Extended Unique Interpretive. Occasionally naturalists conduct special extended hikes or excursions which go beyond the limits of a simple nature hike. The parameters of each excursion are delineated by the special circumstances present in each situation. An outstanding recent example was the evening "coon hunt and yarn telling excursion" conducted by naturalist Thomas Whetzel at the Meadowside Nature Center in Rockville, Maryland.

7. Exhaustive Nature Study on a Limited Site. The literature designates two types of exhaustive nature studies (e.g. inventories of the flora and fauna present) to be conducted on a limited site. These are listed below.

a. Nature by the Square Yard. Utilizing square yards of forest, field, marsh and other types of terrestrial habitats, the naturalist can show the clientele how markedly the flora and invertebrate fauna differ from site to site.

b. Quadrate (or Plot) Ecology Study Method. This type of study is similar to the above but often involves a more advanced level of learning. Gabrielsen and Holtzer (1965) note that it is usually pursued in conjunction with a high school science class. The technique involves staking out a plot of land, the size of which depends on the organisms to be studied and the vegetation type and vertical strata to be analyzed. Ashbaugh and Kordish (1971) suggest that the following information can be studied on the quadrate: slope; exposure to sunlight; temperature;

soil pH; compaction of soil; porosity of the soil; and numbers, diversity and interrelationships of plants and animals.

8. Exhibits, Special Trailside. Some exhibits which portray or display particular aspects of natural history can be utilized outside in weatherproof, vandal resistant cases. Several authorities (Thompson 1974a, Mahaffey and Berger 1972) note that these exhibits can be utilized along roadsides in or near the park as well as along nature trails. A prime example of the former is to be found on the backroads proceeding through the Yorktown National Battlefield, Yorktown, Virginia. These types of outside exhibits will give a limited interpretive message to some sedentary visitors who either do not desire, or are unable, to leave their cars in order to enter into the natural environment (Thompson 1974a). Additionally, wayside exhibits have been used by nature centers to illustrate special topics of interest along interpretive trails. Some criticism of the latter technique has been forwarded in that this procedure brings the artificial into the natural environment.

9. Field Trips. A seldom used but potentially valuable technique is to sponsor naturalist led field trips to expose the clientele to special interpretive features not present on the nature center property. The use of this technique is probably limited because of the funds necessary and the red tape involved in coordinating such an activity. However, it could be incorporated for special interest groups.

10. Living Exhibits of the Past. A closely allied (to natural history) sphere of facilities is that which deals with living reminders of life in the past. Often these facilities are used for interpreting human history, but they may be useful in interpreting natural history also, especially since the lives of our forefathers were so much more closely

allied and attached to the land. This realm of interpretive facilities can be divided into the following categories.

a. Living Farms of the Past. Kay (1970) notes that in 1970 only 8% of Americans remained "down on the farm," a marked contrast from the 90% living thereon during the American Revolution. Living farms (also known as "rural life centers") are popular and important additions to any nature center. Many types of farm animals (e.g. goats, pigs, domestic fowl) can be incorporated into the facility. Ashbaugh and Kordish (1971) note that for larger interpretive facilities, planting, harvesting and rural household activities can also be included as part of the interpretive package. Ideal examples of such interpretive farms are located at the Rock Creek Regional Park in Wheaton, Maryland; the Aullwood Audubon Farm near Dayton, Ohio; and the Busch Gardens in St. Louis, Missouri. Since these farms involve a significant undertaking, they are often operated by a cooperative facility in close association with the nature center. Kay (1970) summarizes their importance by stating that

> For city bred children, it [the farm] is a new world, for the city orientated adult, it is often a reminder of a more leisurely, more innocent day when our ancestors lived close to nature.

b. Living Crafts of the Past. The National Park Service pamphlet, Living History in the National Park System (National Park Service 1971), notes that modern Americans are, in marked contrast to their ancestors, both detached from, and yet, dependent upon each other for goods, services and expertise. To reduce this detachment and to preserve the living legends of days prior to occupational specialization, nature centers are sponsoring and incorporating living crafts into their programs. All manner of crafts of the past are demonstrable, from whiskey making (e.g. at the Catoctin Mountain Park, Thurmont, Maryland) to dyeing cloth from natural dyes (e.g. at the Meadowside Nature Center, Rockville, Maryland). The naturalist staff is often supplemented by local craftsmen who volunteer to demonstrate their expertise.

c. Living Military of the Past. Living military of the past exhibits and programs offer exciting areas of interpretation, primarily in the realm of human history. These include exhibits of period uniforms, weaponry, close order drill and military tactics. Some related natural history can occasionally be brought into the presentation since the outcome of military conflicts in the past was often determined by the effects of natural phenomena (e.g. diseases, geological structures, etc.). Excellent examples of living military of the past can be seen at Fort Frederick State Park, Big Pool, Maryland and at Fort McHenry National Monument and Historic Shrine, Baltimore, Maryland.

11. Night Time Walks. Several naturalists have suggested that night time interpretive hikes could have significant potential in a nature center's overall package. For example, Brown (1972) notes "...how few of these people [clientele] realize what a grand and still safe adventure the dark can be, and how filled with interest and wonder." Similarly, the emminent naturalist Herbert Stoddard (1969) notes

> Curiously enough many people interested in nature confine their investigations to diurnal animal life. Not until they have experienced the rewards of nocturnal wanderings can they claim real familiarity with their environment. It is well worthwhile for the naturalist to form the habit of living 24 hours a day. Many of my most memorable outdoor experiences have occured on nightime excursions.

The author did not find in the literature the techniques to be employed in such a night time interpretive hike. Presumably the clientele involved would need to be a select and limited group. The members would certainly need to have developed some affinity for the natural environment prior to being accepted for such an excursion.

12. Observatory Towers and Blinds. A significant portion of the clientele who venture out of doors are interested in viewing a beautiful natural panorama. To facilitate this group, an observation tower can be erected. Ashbaugh and Kordish (1971) note that such a tower offers excellent interpretive possibilities for discussing the geological formations and/or habitat types seen on the surrounding countryside. The author presumes that a smaller yet still significant number of people are interested in extended observations of nature in the field. For them an observatory blind can be constructed. Good places for such blinds are near bird or mammal feeders, near bodies of standing and running water (e.g. streams, ponds, bogs, marshes, etc.) and/or at the interface between two or more terrestrial habitat types.

13. Outside Exhibits. Grouped under this heading of outside exhibits are facilities similar to indoor exhibits (in that they are structurally static and they deal with one particular topic) but which are located out of doors. Examples of these are delineated below.

a. Weather Stations. The study of weather is an inherent and important segment of an overall investigation into the ecology of an area. Some meteorological materials can be made by students, interested clientele or the naturalist staff. Often the outside instruments can be coordinated with an inside exhibit dealing with the parameters of meteorology.

b. Feeding Stations. Many nature centers employ feeding stations (including salt licks for ungulates) to attract wildlife to sites where they can be observed by the clientele. Flyger (1970) notes that such a station can attract a wide diversity of vertebrate forms including mammals, birds and reptiles. The incorporation of a water-providing device near the feeder will further increase the numbers and diversity of species utilizing the area. For example, gallinaceous guzzlers have proven to be eminently successful in increasing the numbers and distribution of California quail (Lophortyx californica), Hungarian partridges (Perdix perdix), mourning doves (Zenaidura macroura), and other birds in semiarid regions throughout the American Southwest (Emlen and Glading 1945, Glading 1947, Edminster 1954).

c. Sundial. A sundial can be an important part of natural and historical interpretation at a nature center. The presentation of such topics as astronomy, the passing of seasons, and the history of scientific development could effectively utilize a sundial.

d. Rock and Geology Walls. Rock walls can be important additions to a nature center. Besides providing aesthetically pleasing boundaries, they also offer illustrative material concerning pioneer life, as well as providing havens and homes for many types of smaller vertebrates. Additionally, if they incorporate rock outcrops or examples of various strata from the immediate area, they can offer the clientele interesting and informative firsthand experiences with the geology of the region.

e. Botany Pool, Pond or Natural Spring. A botany pool is a popular outside nature center facility. It can be any size (the average is 6' x 10') and can be placed anywhere that aquatic plants such as pickerelweeds (Pontederia spp.), cattails (Typha ssp.) and rushes will grow.

f. Stream Improvement Demonstration Site. Stream improvement is an important concept to be portrayed at nature centers, especially in urban, piedmont, or mountainous areas. Ashbaugh and Kordish (1971) note that potential facilities to be employed in the stream area include low rock or log dams, log and stone deflectors, rock ripraps and stream bank plantings.

g. Garden Plots. An important outside facility for a nature center is a garden, featuring vegetables, flowers or herbs. Ashbaugh (1973) notes that gardening (an avocation with many people) constitutes an excellent interpretive tool in that it provides a living demonstration of the link between the soil and the food we consume. Additionally, herb gardens fit especially well into historical interpretation since they often feature perennial teas and medicinal plants which were important to the colonists, explorers and mountaineers in America's past.

h. Forestry Management Plots. Forestry management is becoming an increasingly important part of natural resources management since "multiple usage" has become the byword for public owned forested sites. It would seem appropriate, therefore, that nature centers develop miniature forestry plantations, tree farms and Christmas tree "plantations" to demonstrate the concepts inherent in forestry management. A prime example of such an interpretive development is located at the Wye Institute grounds near Wye Mills, Maryland.

i. Wildlife Food Planting. A basic concept in ecology concerns the fact that wildlife numbers and diversity can be significantly increased by an intricate pattern of food cover plots designed to produce a great amount of "edge effect." This phenomenon should certainly be incorporated into a nature center's outdoor plans.

j. Stump and Log Exhibit. Stumps and old logs can form very interesting outside exhibits. Old logs provide havens and homes for many small invertebrates and are perfect examples of the process of decomposition. Non-decomposed stumps can be used to show the exciting story of annual ring growth and the silent history intertwined therein. Comstock (1918) notes the following in this regard.

> Perhaps in no other way may the attention of the pupil be turned so naturally to great events as through the thought that the life of a tree has spanned so much of human history. The life history of one of these ancient trees should be made the center of local history....

Gabrielsen and Holtzer (1965) call this type of activity "stump scouting" and suggest that the history of the tree can be studied by close examination of the stump and fallen trunk.

14. Star Gazing. Star gazing is an interpretive technique which is encouraged and utilized by (among others) National Park Service naturalists. Techniques for such a program are outlined by Hubbard and Dunmire (1968) and by Ickis (1938).

15. Tours, Self-guided and/or Naturalist Guided by Car, Horseback, Scuba/Snorkel or Boat. Some nature centers which serve a large geographical area or which have sites nearby with unique natural phenomena have initiated the use of car, horseback, boat or swimming nature tours. Car interpretive tours developed in the late 1920's when large western U.S.A. parks had extensive areas in which interpretation was needed (Bryant 1960). Recently, Cantu (1973) noted that with the great increase in numbers of clientele, a modification of this technique would be to provide casette recordings for cars or have special short range radio broadcasts for self-guided car tours. Similarly, other types of unique tours have developed (e.g. horseback,

scuba/snorkel, boat) when and where special parameters are present.

16. Trails. Perhaps the most traditional and important outside facility in nature interpretation is the common trail. The Bureau of Outdoor Recreation (1966) notes that trails offer a low concentrated and dispersed type of activity which is of great demand from certain segments of modern society. Their increasing popularity is denoted by the fact that 30 million people in the U.S. alone have enjoyed nature walks on nature trails (Ashbaugh and Kordish 1971). Ashbaugh and Kordish (1971) note that generally speaking, interpretive trails can be divided into three types. These are: (1) formal teaching trails (those whose main emphasis is on interpretation) (2) walking or hiking trails (where casual walking in the outdoors is the primary utilization) and (3) special use trails (where the "use" is of primary importance; e.g. equestrian trails, underwater trails, etc.). For this report, the interpretive employment of trails has been divided into four groups as outlined below.

a. Trails, Regular. Any interpretive facility should have nature trails of several types. If the interpretive program is just beginning, or if funds are very limited, the trails need not feature expensive interpretive aids or necessitate the presence of professional interpreters. Rather, it is important to provide trails which simply expose the clientele to the land. Ashbaugh (1973) describes this objective as giving the clientele "...a feel for the land, what it is, what it contains--its dynamic character."

All trails should vary in length and layout. Especially effective are those which are winding, thus giving a sense of discovery to the hiker, those which progress through or by as many biotic and geologic types of areas as possible, and those which allow hikers to terminate their walk early if so desired (e.g. figure eight trails).

b. Self-guided Nature Trails. John Burroughs, emminent early 19th century naturalist, once noted (Price 1950), "If this woods had labels it would make the most interesting museum of natural history in the world." From this concept arose one of the most important developments in nature interpretation, that being the self-guided nature trail. This type of trail provides the clientele with significant interpretive information to be used on their hike, but without the commitment or attention of a naturalist. It is especially ideal for people who might like to use the trails at times when naturalists are otherwise occupied and for those people who like to study nature individually and at their own pace. Cornwell and Holcomb (1966) corroborate the above.

The most common instrument used in conjunction with a self-guided nature trail is an interpretive pamphlet which contains paragraphs denoting interpretive information relating to specific points on the trail. Often a central theme of the trail can be delineated and specific features on the trail can be related to each other. Recently, Wagar (1972b) noted that inexpensive casette tape recorders could be used in place of interpretive pamphlets to give a more personal touch to the interpretive message. He found that visitor enjoyment and retention of information was greater for all tape presentations than for any type of written information. A very informative discussion concerning many other characteristics and parameters of self-guided nature trails is available in Brown (1940).

A significant problem with any type of self-guided nature trail is that any mobile or transitory phenomenon of nature cannot be professionally interpreted (e.g. the movements of animals, especially mammalian forms). This is the inexorable cost of interpretation without the actual interpreter being present.

C. Naturalist Guided Nature Hikes. The Michigan State Park System (n.d.) notes that a naturalist guided nature hike entails "...interpretation which takes place in the environment itself, utilizing the actual objects of nature or of history to reveal and to illustrate the interpretive theme." This is certainly the most optimum type of nature hike experience and potentially the most valuable of all interpretive programs for the clientele. Here a naturalist can introduce a group of people to the intricacies of the natural world, weaving the interpretation at different sites into a unified message. Furthermore, the interpretation can include any transitory event which may be of interest or concern to the group. The naturalist can answer questions as they are asked. Additionally, he can actively cultivate accurate and detailed observation by the clientele by pointing out often overlooked phenomena. Gabrielsen and Holtzer (1965) corroborate the above.

d. Trails for the Handicapped (Physically and Mentally). Many nature centers have recently provided special trails for the physically and mentally handicapped. For example, special rope lined trails with interpretive trail markers (having braille messages) can be set up for the blind. Additionally, Garvey (1968) notes that for the blind, such natural phenomena as the damp smell of woods after a summer rain, the sound of dry leaves underfoot and the steep grade leading to a fast running stream are all examples of interpretive potentials for the sightless. Similarly, other special trails and techniques can be developed for other types of handicapped clientele.

The Art of Nature Interpretation: A Synopsis of Techniques

The art of nature interpretation involves a wide spectrum of skills and techniques. To be a "good" interpreter requires cognitive skills, as well as a particular attitudinal bearing toward the subject and the clientele. Complicating the picture is the fact that the clientele as a group will often be a melting pot of diversity, demonstrating a wide latitude in outdoor experiences, skills, interests, receptivity and understanding (Shomon 1968).

A pioneer in conservation education and interpretation, Professor W. N. Hutt (1905) noted, "The best teacher is the one who makes his subject most knowable." Furthermore he exhorts the nature instructor to "...try to make education as unconscious and as pleasurable as possible." With these twin objectives in mind, what should the general structure (or "art") of nature interpretation be? The approach to the presentation may be the critical point. Boulanger and Smith (1973) note in this regard that

> One of the most creative aspects of interpretation is selecting and organizing experiences for your visitor. You must decide what kind of sequences or experiences will best achieve your objectives.

This then is the art of interpretation. It is interpretation geared toward the age, education, receptivity and correlated parameters of the clientele. Generally, neither the extreme of sole sentimentality, nor the presentation of cold scientific facts is acceptable, but rather a midpoint between the two. What is needed is a stimulating presentation that is rewarding to the clientele. In fact, Wagar (1972b) notes that the ability to create this type of rewarding experience for the clientele is "crucial to being effective [as an interpreter]."

The following alphabetical listing is presented as a summarization of the techniques and skills which together entail the "art of nature interpretation." Although it is not presupposed to be comprehensive, it is intended to go beyond the foundation of nature interpretation techniques, that being Tilden's "six principles" (Appendix 1).

1. Beauty, The Interpretation of. Several authorities (e.g. Hodge 1902, Tilden 1957, Tilden 1962) note that beauty in nature does not need or profit from interpretation. It can and should speak for itself. Only after the initial impact is past for the clientele can questions such as, "What geological force formed this structure?" or "How is that animal equipped to do that feat?" arise and the interpretive process continue.

2. Children, Interpretation for. One of Tilden's six principles of interpretation deals specifically with children. It suggests that interpretation for children should be fundamentally unique (Tilden 1957). The rationale for this is, in part, the acceptance of, and even desire for, pure information on the part of children, something which adults may display an aversion to. Several authorities (Tilden 1957, Gross and Railton 1972) note that the interpreter should attempt, especially when dealing with children, to activate all of their senses, immersing them in the stimulus of the thing being interpreted. Finally, the interpreter must attempt to establish a rapport with the children. This means that they must begin to feel like they are his companions on an adventure. He is not just an educator, or even an interpreter, but rather a fellow explorer. In this context, Nicklesburg (1960) notes that

> If we adults were but satisfied to substitute for the concept of a teacher-pupil relationship one of companions-in-adventure, nature itself would bridge the gap between the children and ourselves. For by enjoying it each in our own way, we are drawn together by a common love of adventure and discovery.

3. Clientele Participation. One of the basic tenets of nature interpretation is the encouragement of clientele participation in natural history activities. The clientele are not to be spectators but rather participants. This concept is supportive of the activity method of instruction ("people learn only those things which they live") as advocated by William H. Kilpatrick (from Gabrielsen and Holtzer 1965). Furthermore, as noted previously, nature interpretation must be a rewarding experience. What is more rewarding than personal participation and discovery (supporting discussion and data in Wagar 1972b)? In this regard it is important for interpreters to get the clientele outside as soon as possible so that they can get "their feet wet" and their hands soiled in the natural environment. Furthermore, in the actual presentation, the interpreter should elicit from the clientele tidbits of personal information. This type of personal participation encourages personal conclusions (not dictated ones), and results in clientele who are taking small, yet independent steps toward understanding.

4. Emotional Impact. There appears to be a fine line drawn in the literature between the acceptability of an emotional impact to the clientele (especially children) and the unacceptability of sentimentality. It appears that the critical point may be the predisposition of the clientele for such interpretation, perhaps conditioned by their age, sex, educational level or other parameters. Coulter et al. (1909) note that blatant sentimentality "...has the effect of blunting keen observation..." (corroborative discussion by Schultz 1962). On the other hand, several authors support the creation of an emotional impact on the clientele. For example, Gabrielsen and Holtzer (1965) note that for children some experiences (e.g. sitting quietly on a hillside watching a sunset while

a poem is read) may have far more interpretive value than a coldly scientific discussion of sunsets, their causes and effects. Similarly, Schmucker (1911) urges interpreters dealing with children to make their "first vision glorious."

5. Facts or Feelings. In conjunction and corroboration with the discussion in #4 above, several authors have discussed the relative importance of facts versus feelings in the interpretive presentation. Tilden (1957), Price (1950), Carson (1956), Schmucker (1911), Goff (n.d.), Vinal (1926), and Aldridge (1973) all are adamant concerning the value of feeling/attitude transferral from interpreter to clientele. This concept, in fact, is inherent in Tilden's second principle of interpretation. He denotes in this regard that true interpretation does not arise from "...mere recitation of facts, nor with [from] the names of things, but by exposing the soul of things" (Tilden 1957). Interpreters must culture sensitivity as well as, or perhaps even in preference to, raw knowledge. A strong presentation of facts and adamant defense of them may lead to destruction of incentive in the clientele with a resulting sterilization of the predisposition to increase their knowledge of the natural environment.

6. Handicapped, Techniques for the. Nicklesburg (1960) gives a good resume of nature interpretation techniques for the handicapped. His tenets can be summarized as below.

a. Handicapped people (especially children) essentially have the same tastes, interests, etc. as other people. They should be given a program which is as close to the norm as possible.

b. The interpreter, when working with handicapped people, should encourage use of the abilities that they have, rather than concern himself with the abilities they lack.

c. Interpretive programs should exhibit flexibility as one of their primary characteristics. As such, many interpretive programs should not have to be substantially changed when working with the handicapped (corroborative discussion found in Carroll n.d. and Bureau of Outdoor Recreation n.d.).

7. Interpreter, Excitement and Enthusiasm by the. Shomon (1968) notes that "...excitement and enthusiasm for nature is basic to outdoor interpretive activities of any sort." This personal quality need not entail an extrovertish bubbling of excitement, but rather a genuine concern for the subject matter and a desire to relate this material to the clientele.

8. Interpreter, Personal Service by and Contact with the. The importance of personal contact and service by the interpreter to the clientele is noted by several authors. For example, Shomon (1968) calls "personal service" the "...hallmark of good interpretation...." Likewise, Tilden (1957) notes that "there will never be a device of telecommunication as satisfactory as the direct contact [of the interpreter], not merely with the voice, but with the hand, the eye, the casual and meaningful ad lib...." When professional interpretation first became available, the personal service of the interpreter was expected as a condition of the presentation. However, with the great increase in number of clientele and the resulting demands for the interpreter's time, personal contact has in some cases had to be sacrificed and replaced by electronic units, pamphlets, self-guided tours and nature trails.

9. Mechanical Devices, Techniques for Their Use. The original philosophy and theoretical basis for developing and using mechanical

devices in interpretive programs and facilities was that they were to assist interpreters in presenting a personal interpretive package. Their development was accelerated in many cases when the clientele load became too great for the staff naturalists. These devices could pick up the interpretive slack, without entailing a large outlay of the staff time. However, several authorities (e.g. Barkley n.d., Thompson 1974a, Edwards 1971, Schultz 1962, Goff n.d., MacFarlane 1974) feel that these devices may tend to be (or have been) substituted for a personal interpretive presentation in many cases.

10. Nomenclature, Scientific or Popular, and Exactness in Observation. It is important to note that several authorities (e.g. Coulter et al. 1909, Nickelsburg 1960, Hutt 1905, Tilden 1957, Colpitts 1971) suggest that technical exactness (as often exemplified by the use of scientific terminology) can be destructive to nature interpretation. Here again one can see the unique position of nature interpretation as being neither totally a science nor an art. This is not to suggest that nature interpretation should allow inaccuracy. Rather, techniques are needed which will help maintain and cultivate enthusiasm in the clientele. In this regard, Stevens (1936) suggests that, for young children, made-up names may be superior to the real name, especially if they elicit interest, understanding and recall. Coulter et al. (1909) suggest that until the clientele become versed and "comfortable" in nature, the interpreter should utilize general observations and impressions. After these impressions are established and understood, presentations of a more technical and exact nature may follow.

11. Observations, Developing Careful and Discrete. Several authorities (e.g. American Association for Health, Physical Education and Recreation

1963; Nickelsburg 1960; Comstock 1918) have noted that careful observation is often the key component to a successful nature interpretation program. Careful observation can be developed by constructing and presenting a nature interpretation package which appeals to and utilizes all of the senses, not just in the interpreter, but more importantly, in the clientele. In this regard, Green (1926) suggests that careful observation can be nurtured by: (1) developing a sense of eager anticipation in the clientele and (2) discussing the intricacies of the commonplace, that which the clientele can experience regularly. The ultimate objective in this regards, succinctly stated by Coulter et al. (1909) is the creation of "...a state of mind that compels observation, that is interested in the meaning of things, that is cautious in drawing conclusions, that is making continual progress."

12. Pre and Post Visit Information. An important interpretive technique for use with school or civic groups (especially for grades K-12) is the providing of a pre and post visit information package relative to their visit (supporting discussion by Ashbaugh and Kordish 1971, Vinal 1926, Milmine and Yarrow 1972, Roller and Green 1967, Tilden 1957, Ashbaugh 1973). These materials provide for a more thorough overview and summarization of the visit and can be important in oral or written testing for academic groups. They can often be formulated in collaboration with the group leader or instructor of the class.

13. Program Changes. Nature center programs and facilities, both inside and outside, should be dynamic and fresh in character. This will assist in maintaining clientele interest (especially among those who visit the center often) as well as being stimulating to the staff. With specific reference to naturalist guided hikes, Breiding (1952) and Price (1950)

both suggest that the hike and the interpretive message(s) provided should change frequently, perhaps with the seasons.

14. Questions, Importance of. One of Tilden's six principles of interpretation states, "The chief aim of Interpretation is not instruction, but provocation"(Tilden 1957). How is provocation of the clientele's mind effected? One premier method suggested by several authorities (Nickelsburg 1960, Wagar 1972b, Ashbaugh and Kordish 1971) is to utilize carefully planned and strategically placed questions directed to the clientele and to himself. These questions may include inquiries for which the interpreter does not have the answers. Hopefully, this technique will stimulate a series of questions, a meaningful dialogue and a mutual search for the answers. Therein lies the key: provocation stimulates searching and searching constitutes what Hodge (1902) calls "...the primordial element in all life, in all education."

15. Story Line, Parameter of the. Perhaps the most crucial element influencing the success of the interpretive package is the parameters of the oral presentation. There are many inputs in this regard, some of which are beyond the scope of this paper. Nevertheless, the following list is presented as a foundation.

a. Limit the Scope of the Talk. Several authorities (Thompson 1975, Knudsen n.d.) emphasize the importance of limiting the scope of a nature talk to a subject area which can be adequately handled and which will focus the attention of the clinetele on one issue rather than a hodgepodge of mini-topics.

b. Devise a Theme for the Talk. This concept is especially important on nature hikes. Often the naturalist will be tempted to talk about a wide spectrum of topics. If this is done, however, a disjointed and confusing presentation may result. Knudsen (n.d.) is particularly emphatic in support of this concept. This is not to suggest that a nature hike should be systematized, but rather that a single direction should be followed.*

c. Make the First Impression "Glorious" if Possible. Tilden (1957) and Schmucker (1911) note the importance of making the initial clientele stimulus (whether indoors or outdoors) exciting and stimulating. This is especially important with children in that it immediately captivates their interest.

d. Convey the "Wholeness" of Ecology. Throughout the literature dealing with the "art of nature interpretation," many authorities (e.g. Tilden 1957, Price 1950, Coulter et al. 1909, Ashbaugh 1973, Ashbaugh and Kordish 1971, National Park Service 1954, National Park Service 1974, Gabrielsen and Holtzer 1965) note the importance of structuring interpretive messages so that they convey the "wholeness of ecology." Individual observations or lessons should be so structured and delivered that they will naturally fit into a framework which emphasizes the complexity, interrelatedness and importance of the environment (i.e. the web of life).

e. Emphasize the Positive. Cantu (1973) notes that many visitors are annoyed or disturbed by hardsell "sermons" concerning the effects of environmental degradation. Instead, the positive approach is recommended. Cantu (1973) suggests that an example of the positive approach could incorporate the following tack "...here it is, it's beautiful, you are a part of it, you have a constructive role to play."

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* fairly comprehensive annotated lists of interpretive themes can be found in Knudsen (n.d.) and Ickis (1938)

f. Give the Interpretive Dialogue a Flowing Character. Shomon (1968) notes the progression inherent to a flowing interpretive story line, that being orientation, sequential presentation, recapitulation and strong conclusion.

16. Urban Ecosystem Interpretation. Several authorities (e.g. Milmine and Yarrow 1972, Cantu 1973, Schmitt 1969, Tucker 1970) have suggested that relating effectively to urban people (especially children) requires certain crucial modifications in the presentation, in the interpretive site, and in the techniques employed. The author feels that a discussion of the techniques to be used under these conditions may be somewhat beyond the scope of this paper. A thorough statement in this regard is found in Milmine and Yarrow (1972).

What can be said in conclusion to this section on the art of nature interpretation? It seems appropriate to the author to simply note that techniques in and for nature interpretation are worthless if the spirit of nature interpretation is not present and evident in the entire presentation. This spirit embodies love and respect for the outdoors and for the clientele (Vinal 1926). Meaningful presentations (i.e. what Tilden 1957 calls "pure interpretation") result when the knowledge of nature is welded to the spirit of nature interpretation.

A CASE STUDY OF TWO MONTGOMERY COUNTY, MARYLAND (M.N.C.P.P.C.) NATURE CENTERS

Introduction

As was noted in the introduction, one section of this paper deals with a case study of two of the Montgomery County, Maryland nature centers under the auspices of the Maryland-National Capital Park and Planning Commission (M.N.C.P.P.C.). One of these centers, Brookside Nature Center, is located on Glenallan Avenue in Wheaton, Maryland. The site is on the northern edge of Wheaton Regional Park and is adjacent to the long and narrow Northwest Branch Park. The other nature center, Meadowside Nature Center, is located on Meadowside Lane in Rockville, Md. (Appendix 2). It is located in the northern sector of the long, irregularly-shaped Rock Creek Park. Presented below is a description of the sites and a summary of the activities, programs and facilities of the past and present.

History of the Sites

Brookside Nature Center. The history of Brookside Nature Center dates to the mid and late 1950's. Ernst (1975) notes that Mr. J. Hewitt, then Director of Parks, Mr. F. Frank Rubini, Associate Director of Parks, and Mr. Carl Schoening, Park Horticulturist, were the principal motivators providing impetus for the creation of Brookside Nature Center. After determining the need for, and feasibility of, obtaining a nature center in Wheaton, Maryland, these men contacted Mr. Stanton Ernst, then with the New York State Conservation Department, and charged him with the development and implementation of a nature interpretation program. Meanwhile, funds had been collected in support of this program (via tax revenues) and the land acquisition had already begun. The immediate site of the nature center was acquired through condemnation proceedings from the Brook family in 1959. The physical conversion of the building from a private residence to a nature center began in September, 1959 and nine months later on May 19, 1961 the Brookside Nature Center was officially dedicated to the public.

The center has had three different directors (presently titled "senior park naturalist") since its inception. Presently, Mr. Kenneth Ernst is senior park naturalist. He has a paid staff of three full-time naturalists and one part-time naturalist.

Meadowside Nature Center. The Meadowside Nature Center is a more recent addition to the M.N.C.P.P.C. interpretive facilities. Funds were made available for construction of the facility via the M.N.C.P.P.C. Capital Improvement Plan and through matching funds from the U.S. Bureau of Outdoor Recreation. Construction on the center began in September, 1970 with interpretive programs for the public beginning around September, 1971. The center was officially dedicated to the public on February 20, 1972.

The center has had only one senior park naturalist, Mr. William Nopper. Mr. Nopper has a paid staff of three full-time naturalists and one part-time naturalist.

Description of the Sites

Position in the Community (Community Dynamics)

Brookside Nature Center. Brookside Nature Center is located in what is presently the heart of suburbia. To the east, west and south lie extensive residential communities which blend into the metropolis of greater Washington, D.C. Similar development has occurred (but to a much smaller degree) to the north. This residential construction in the north has been slowed by the presence of the Northwest Branch Park, two country clubs and the Holy Father Seminary.

Meadowside Nature Center. Meadowside Nature Center is located in what is presently the edge of suburbia. To the southeast lies the city of Rockville, to the southwest lies the burgeoning overflow of residential development from the cities of Wheaton and Silver Spring. To the north, however, lies open farmland, interspaced with small communities and limited residential development. The twin forks of Upper Rock Creek Park and the presence of three country clubs may tend to maintain the rural atmosphere and appearance of the land to the north.

Botanical Characteristics

Brookside Nature Center. Brookside Nature Center is situated in the midst of a beautiful example of a mature eastern deciduous forest. The upper canopy botanical make-up is characterized by such species as white oak (*Quercus alba*), red maple (*Acer rubrum*), hickory (*Carya* spp.), tulip poplar (*Liriodendron tulipifera*), and beech (*Fagus* spp.). Interspaced in the woods and along roadways are small stands of Virginia pine (*Pinus virginiana*), and/or white pine (*Pinus strobus*). The understory is characterized by such species as dogwood (Fagus spp.), sassafras (Sassafras spp.), American holly (Ilex opaca) and ironwood (Ostrya virginia). The forest floor contains such species as may apple (Podophyllum peltatum), ground pine (Lycopodium tristachyum), mountain laurel (Kalmia latifolia), greenbrier (Smilax spp.) and honeysuckle (Lonicera spp.). Collaborative discussions of the above are found in Brown and Brown (1972), Salisbury (1974), Hougart (1974), Hammond (1968), Dietemann and Giraldi (1974).

Meadowside Nature Center. Meadowside Nature Center, set in a 350 acre natural area of Rock Creek Regional Park, is fortunate in that it contains several habitat types. Thus, the botanical characteristics of the site are more varied than at Brookside Nature Center. Like Brookside it contains a mature eastern deciduous forest. Additionally, however, there are extensive areas of abandoned agricultural fields which have been allowed to botanically succeed (they were last grazed by livestock in 1969-1970). The plant association on these areas is characterized by the presence of many small to medium sized red cedars (Juniperus virginiana). Also present are many patches of blackberry (Rubus spp.), multiflora rose (Rosa multiflora), and sumac (Rhus typhina). Characteristic grasses in the fields include brooksedge (Andropogon virginicus), orchard grass (Dactylis glomerata) and foxtail millet (Setaria italica) (Nopper 1976; personal communication 1976 from J. Welch, U.S. Army Med. Bioeng. and R & D Lab, Ft. Detrick, Frederick, Md.).

Wildlife Present

Brookside Nature Center. The forests which surround Brookside Nature Center contain many of the faunal forms characteristic of the deciduous forests. Representative mammalian species include white footed mice (*Peromyscus leucopus*), short tailed shrews (*Blarina brevicauda*), chipmunks (*Tamias striatus*), gray squirrels (*Sciurus carolinensis*), flying squirrels (*Glaucomys volans*), red foxes (*Vulpes fulva*) and white tailed deer (*Odocoileus virginiana*). Notably absent are the predatory cats, the fox squirrel (*Sciurus niger*) and perhaps the beaver (*Castor canadensis*). Many species of passerine birds are present, along with certain species of waterfowl and birds of prey. Notably absent are bald eagles (*Halialetus leucocephalus*) and certain other large predatory birds. The diversity of lower forms (e.g. fishes, amphibians, reptiles and insects) is similar to the norm for a mid-Atlantic deciduous forest. The above is substantiated by Paradiso (1969), Stewart and Robbins (1958), Dietmann and Giraldi (1974) and Ernst (1964).

Meadowside Nature Center. The habitats present at Meadowside Nature Center provide a diverse faunal arrangement. The mammalian and avian forest life there is similar to that present at Brookside Nature Center. The fields and swamplands contain characteristic passerine birds, as well as additional mammalian forms such as meadow voles (*Microtus pennsylvanicus*) and woodchucks (*Marmota monax*). The lower form diversity is similar to that present at Brookside Nature Center.

Geological Characteristics

Brookside Nature Center. Brookside Nature Center is located in the piedmont region of Maryland. The terrain of the site is mildly rolling to level with some steep slopes leading to the stream bottom. The elevation generally is between 250 and 400 feet. Crystalline rocks of the eastern Wissahickon formation (pre-Cambrian age) compose the substrata.

Occasional quartz outcroppings are present along with thin layers of mica and chlorite. The soils are mostly Glenelg silt loams or channery silt loams. Prospecting pits (for gold) are rumored to be present but this information has not been authenticated (personal communication 1975 from K. Ernst; Hammond 1968).

Meadowside Nature Center. Meadowside Nature Center is also located in the piedmont region of Maryland. Its topography is characterized by the rolling hills which are so prevalent in the immediately adjacent western counties. The highest elevation on the site is 416 feet. The soil type is Manor silt loam. Gneiss and mica schist compose much of the substrata. Occasional upright positioning of the strata is evident near the stream and the upper portion of nearby Lake Frank. Many large boulders (rock outcrops) are found around the hillsides adjacent to the stream (personal communication 1975 from W. Nopper).

Present Programs and Facilities

The programs and facilities of the two M.N.C.P.P.C. Montgomery County nature centers incorporate much of the spectrum delineated previously in this paper. The following lists will specify the present programs and facilities of each nature center, and in some cases, will give a short explanatory note concerning the item.

Brookside Nature Center

Introduction. Brookside Nature Center is a very traditional nature center. Its homey appearance and atmosphere result at least in part from its transition from a private dwelling, from its hemlock, mountain laurel shrouded entrance, and from its rustic interior. Ernst (1975) notes that the exhibits are a potpourri in that they do not reflect a strong central theme(s). Rather, the exhibits have resulted much from the interests and requests of the clientele and from the individual preferences of the three directors which the center has had.

Inside Programs and Facilities

1. Animals, Living. The center features an inside bee hive where visitors can see honey bees at work. The hive has an outside entrance and glass walls.

2. Animals, Mounted. Taxidermy mounts are found in several locations in the center. In the lecture room there are four diorama type exhibits which have animals in natural scenes. The touch-see exhibit room contains 25 animals (16 mammals, 6 fish and 3 other forms). Also, there is a separate bird exhibit containing 24 birds.

3. Aquarium (fish). The center contains five aquariums. Two of a cylindrical type (30 gallons) in the lecture room contain guppies (Poecilia reticulata), a northern banded water snake (Natrix sipedon) and a variety of tropical fish. Two built-in aquariums in the exhibit room contain black nose dace (Rhinichthys atratulus) and bluegill sunfish (Lepomis macrochirus). One large built-in aquarium (150 gallons) contains a large mouth bass (Micropterus salmoides), a catfish (Ictalurus spp.) and several bluegill sunfish. These eat worms voraciously and are often used to demonstrate predation, competition, etc.

4. Building Tours. Building tours are given in the nature center by the naturalist staff. These are primarily for civic and academic groups and are generally given as part of a larger interpretive package.

5. Exhibits, Regular. The center's three exhibit rooms, lecture/ film room and hallway contain exhibits featuring a wide range of topics. Several of these exhibits are described below.

- Bee products. A corner near the bee hive contains a sample of the products which can be made from bee combs and the equipment necessary for working in an apiary.
- Ferns. A small wall exhibit contains ten pressed ferns. They are examples of the diversity of ferns that grow near the nature center. A short description of the types and life histories of ferns is also presented.
- Geology and minerals. This exhibit contains the following: (1) examples of the rocks and minerals found in Maryland (2) the geological structure of Maryland (3) the fauna and geological formations present in Maryland in prehistoric times (4) examples of fossil remains (5) a black light device which illuminates minerals under short wave and long wave radiation.
- Historic log. A portion of a large (42" in diameter) Douglas fir (Pseudotsuga menziesii) log is present in the center. Important historic dates in Maryland's past are noted on the annual rings.
- Weather. A small weather exhibit (6' x 4') contains a working barometer and wind speed indicator, as well as information and pictures on cloud types and their significance. Additionally, there is a small section on facts and myths about weather.

6. Films. Nature and/or outdoor activity films are shown each weekend for the general public. There are three showings on Saturday and two on Sunday. Additionally, films are often shown to academic groups (including extracurricular organizations) as part of the interpretive package.

7. History, Living. Behind the speaker's podium in the lecture/film room is a small living history exhibit. Featured are old artifacts (e.g. snap traps), hanging dry corn and walls made from old farm timbers.

8. Hodgepodge Board. Near the entrance is a hodgepodge board entitled "Pack Rats Cache" which is used for temporary exhibits, for advertizing special concerns, etc.

9. Hobby Clubs. The center supports several hobby clubs, related organizations and programs. These include the Junior Naturalist Program, the Conservation Club, the Brookside Nature Photography Contest and the Charlie Ecology Program.

10. Library. A small library of approximately 425 volumes is located in the adjacent building. It may be used by the general public upon request. It is used extensively for reference purposes by the naturalist staff.

11. Pamphlets and Publications, Free. The nature center and the M.N.C.P.P.C. hierarchy produce a number of free publications. The center itself produces "Nature Notes," a short publication dealing with topics of interest to the local citizenry. Additionally, such M.N.C.P.P.C. publications as Common Trees of Maryland (n.d.), Common Wildflowers of Maryland (n.d.), Beauty Can Be Lethal (n.d.), and A Guide to Parks and Facilities (n.d.) are available for free distribution.

12. Reptile Pond. A reptile pond, measuring 4' x 2' is being constructed and will be available for housing small reptiles and amphibians. It will feature an artificial waterfall which will splash recircling water into the pool. Nearby is a small exhibit showing some of the characteristics of these lower forms.

13. Terrarium. A large terrarium, measuring approximately 5' x 2' x 2' contains many ferns, mosses and other ground covering forms from the local area.

14. Workshops. Occasionally workshops/demonstrations are given at the center for the benefit of the general public. Usually, these deal with skills and crafts from America's yesteryear.

Outside Programs and Facilities

1. Extension Work. The naturalist staff occasionally does extension work when and where it is convenient. For example, on occasion the staff has presented special lecture series at libraries or schools in the local area. Additionally, staff members will help schools or civic organizations set up nature study sites or nature trails on their property.

2. Guided Trail Walks*. Staff naturalists often give guided nature hikes to civic and school groups as part of the overall interpretive program.

3. History, Living. An "Early Maryland Settlement" is being constructed by the naturalist staff and will be in operation by 1976. It will be staffed and operated primarily by local volunteers who have particular skills or interests that relate to the region's heritage.

4. Pond and Stream. In the fall of 1961 a small pond (1/2 acre) was constructed next to a natural stream. The pond has marsh vegetation planted on its edge, nest boxes along the shoreline, and provides habitat for several types of waterfowl. The stream is ideal for demonstrating stream improvement techniques.

5. Trails.

- Self-guided. Since 1961 a 3/4 mile circular self-guided nature trail has been in use.
- Other. Several other trails exist on the nature center's property and on the adjacent parkland. They are often used by visitors seeking more quiet and secluded experiences in nature.

6. Weather Station. A weather station was established in 1961 in cooperation with the U. S. Department of Commerce, National Oceanic and Atmospheric Administration. The instruments including maximum-minimum thermometers, a rain guage, a hygrometer and a thermograph were provided

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* throughout this paper the terms guided walk, guided trail walk and guided nature hike are used synonymously

free of charge by the Department of Commerce. They are used in interpretive talks and also in research efforts in urban meteorology.

7. Wildlife Food Plots. Three 2 1/2 acre tracts have been cut in the woods near the center and are to be planted to wildlife food producing vegetation.

Associated Program

Immediately adjacent to the nature center is the Brookside Gardens, a 50 acre public garden designed and operated by the M.N.C.P.P.C. It offers interpretive talks and tours dealing with the horticulture of native and exotic plants. Featured are aquatic gardens, an indoor stream, and a Japanese garden. The Brookside Nature Center and the Brookside Gardens, although operating independently, cooperate extensively. Questions are often referred to staff members in the sister organization, building facilities are used interchangeably when feasible, and materials are used cooperatively.

Meadowside Nature Center

Introduction. Meadowside Nature Center, being a very contemporary and modern facility, complements beautifully the more traditional Brookside Nature Center. The Meadowside building has three basic sections, and from these divisions, the facilities and programs have evolved. Each section of the building complements and is coordinated with the others. The overall plan anticipates that the clientele will enter the center and be immediately exposed to and impressed by the exhibits of the orientation room (part 1 of the center). From there they will proceed to a museum hall (part 2 of the center). For those visitors who desire an in-depth and expanded exposure to nature, the laboratory and library will be available (part 3 of the center; Appendix 4).

Inside Programs and Facilities

1. Aquarium (fish). The center contains six fish tanks. There are two in the library (one 50 gallon and one 10 gallon) which contain black nose dace. Three 10 gallon tanks in the park naturalist's office contain tropical fish and guppies. Additionally, one 100 gallon tank in the laboratory contains bluegill sunfish and black nose dace.
2. Building Tours. Same as at Brookside Nature Center.
3. Exhibit Board, Special. A special exhibit board, entitled "Meadowside Motif" features exhibits constructed by the staff and/or volunteers.
4. Films. Same as at Brookside Nature Center.
5. History, Living. Living history plays an important role in the orientation and museum rooms of the center. Highlighting the exhibits in this regard is a large 19th Century farm wagon loaded with period artifacts. It is situated just inside the entrance to the center.
6. Hobby Clubs. The center sponsors and supports several hobby clubs, related groups and programs. Included are the Junior Naturalist Program, the Conservation Club, the Charlie Ecology Program, the Explorers' Post and the High School Practicum Program.
7. Laboratory. A laboratory has been set up in a separate room of the center to facilitate advanced instruction and investigations in the natural sciences. It contains regular indoor laboratory equipment (e.g. microscopes, beakers, scales, etc.) and field collecting equipment (e.g. butterfly nets, live animal traps, etc.).

8. Library. A library of approximately 625 volumes is located in a separate room in the rear of the center. Additionally, it contains a card catalogue, a pamphlet file, a set of World Book encyclopedias, charts, and an "article and picture" file.

9. Murals and Enlarged Photographs. Some large murals and enlarged photographs are present in the orientation room. They deal basically with human history rather than natural history.

10. Orientation Panels. Located in the orientation room are nine large panels (approximately 3' x 6'). Their purpose is to create a mood conducive to the appreciation of human and natural history.

11. Pamphlets and Publications, Free. Meadowside Nature Center, like its sister center, distributes pamphlets produced by the M.N.C.P.P.C. Additionally, it produces and distributes "Meadow Mouse Presents" and "Meadowside Grapevine" to announce upcoming events and to discuss topics of interest in natural and human history.

12. Workshops/Demonstrations. Workshops and demonstrations are given by the naturalist staff and volunteer citizens. These usually focus on a craft or skill from America's past.

Expansion of Operations: Meadowside Museum Room

The museum room section of the center is presently under construction. The anticipated opening date is September 1976. This room will incorporate the middle part of a three link interpretive chain, that being: (1) orientation (in the orientation room) (2) exposure (in the museum room) and (3) challenge (in the library and laboratory). The museum room will feature sensory exhibits dealing with natural and human history (e.g. taxidermy mounts, walls made from old farm buildings, wrapped and drying tobacco (*Nicotiana* spp.) leaves, an artificial stream containing the common freshwater fish of Maryland, an artificial cave which leads to an underwater pond observatory, and a room to present crafts and skills of yesteryear.

Outside Programs and Facilities

1. Animals, Living. The center presently houses only one mammal (a rabbit, Sylvilagus spp.) for use in interpretive talks. Additionally, there is a honey bee hive located close to the center.

2. Extension Work. Same as at Brookside Nature Center.

3. Forestry Management. Nopper (1976) notes that extensive areas on the Meadowside site are being utilized for demonstrating forestry management techniques. Since 1970, over 4,000 coniferous seedlings have been planted in this regard. Additionally, 2,000 loblolly pine (Pinus taeda) of uniform height (presently 6') are used to demonstrate concepts inherent to single aged, single species tree plantations.

4. Guided Trail Walks. Staff naturalists at the center give nature hikes to school and civic groups, usually as part of the interpretive package. Occasionally, student assistants and/or special guests give guided hikes which deal with a particular theme (e.g. "boot and camera hike" or "hike into history").

5. History, Living. The Meadowside naturalist staff is cooperating on the construction of a pioneer farmstead. (See the discussion below under Associated Program).

6. Night Time Hikes. Occasional night time hikes are offered by the M.N.C.P.P.C. naturalist staff. These usually originate at the Meadowside Nature Center.

7. Trails.

-- Self-guided. Presently there is one self-guided nature trail, the "Rocky Ridge" trail, which progresses through the Meadowside woodlot. A self-guided field trail is in the planning stage.

— Other. Several other trails exist on the nature center property (e.g. the "Pioneer Trail" and the "Big Pines Trail") as well as in the adjacent park. These lead to the swamp, to Lake Frank, and through the fields and forests of the area.

Associated Program

Located adjacent to the Meadowside Nature Center on a ten acre tract are the facilities of the Lathrop E. Smith Environmental Education Center. This center provides school classes with one week periods of outdoor nature study (Smith 1974). The nature center and the environmental education center cooperate in many projects and undertakings. One case in point is the joint effort (now almost complete) to create a pioneer farmstead on the fields near the two centers. It will feature old log buildings, farm animals, herb and vegetable gardens and other period artifacts. Nopper (1976) notes that extensive and varied cooperative efforts are being formulated for the two organizations in the future.

Changes in the Programs, Facilities and Clientele, 1972 to Present

Since their inception both Brookside Nature Center and Meadowside Nature Center have undergone changes relating to their facilities, programs and clientele. These changes are important to denote since they may reflect alterations in the major parameters (e.g. clientele disposition, experience and expertise of the staff, financial limitations, etc.) which affect the nature centers. The following delineates some of the alterations which have occured in the centers.

Brookside Nature Center

Facilities. The major structural facilities of the Brookside Nature Center have changed little since the center's inception in 1961. The pond was created in 1961, as was the nature trail, the parking lot and the outside weather station. The auditorium was added in 1964. Presently, an early Maryland settlement is under construction and certain modifications in the surrounding habitat are being made.

The inside exhibits of the center have reflected some change. During the center's infancy, the displays were mainly colored pencil drawings, charts, etc. (personal communication 1975 from K. Ernst). Gradually, however, a more professional and varied arrangement of exhibits was incorporated. Once a successful (i.e. popular and meaningful) exhibit was created, it was rarely changed or removed. Thus, the center's policy has generally been to incorporate new exhibits when possible, but not to change exhibits just for the sake of variety.

Programs. It is difficult to note the changes that have occurred in programs offered by the nature center. Ernst (1963) notes that the programs offered to civic and academic groups invariably encompassed "...a natural history talk in the museum building, followed by a trail walk with a staff naturalist, the total program [lasting] approximately two hours." In this regard, Ernst (1975) states

> All programs have evolved primarily as a result of public demand. We have attempted to provide programs requested by groups or individuals, given the limits of staff expertise, staff interest and staff availability. Many programs have evolved by default, that is many groups get nothing more than an indoor program simply because they cannot spend enough time here to tour the out-of-doors and the building.

A more precise measurement of program changes for civic and academic groups is available through an examination of the "Daily Program Log." This log delineates the type of group scheduled, the number of people in the group, and the program to be presented. The Brookside Nature Center program log from the period January 1, 1972 through December 31, 1975 was examined for data in this regard. The results are presented in Appendices 16,18,20. As can be seen, the percentage of programs which incorporate nature center tours has risen over the four year span (from 18.0% to 35.9%) while the percentage of programs which incorporate a weather demonstration has decreased (from 17.1% to 7.1%). The percentage of programs incorporating nature hikes, films, talks, special projects and demonstrations has remained basically unchanged over the sample period.

The daily program log data also reveals the fact that presently each group receives an average of 1.53 activities per program. The most popular combinations are: (1) a film and a nature talk (2) a film and a nature hike (3) a film and a nature center tour. It may be significant to note that the showing of films was not mentioned by Ernst (1963) as part of the nature center group programming.

Concerning procedural trends in programs to be offered by the center, Ernst (1975) predicts an expansion of the number of topics offered in the nature talks, rather than just a general ecology talk being universally offered. Additionally, plans are being formulated for the offering of special interest programs such as photography walks, evening campfire programs, early morning bird hikes, etc.

Clientele. Some indication of the changes in the center's clientele can be obtained through the examination of old reports and the daily program log. Ernst (1963) notes that during 1962, the nature center staff provided nature talks and guided trail hikes for the following:

school groups (from Montgomery and Prince George's Co., Md.)	164
youth civic groups (e.g. Boy and Girl Scouts, 4-H, etc.)	93
civic organization sponsored adult groups (e.g. service clubs)	12

Data gleaned from the daily program log provided the following counts for similar categories of groups coming to Brookside for specific programs from 1972 to 1975.

	1972	1973	1974	1975
school groups	191	180	116	132
youth civic groups	39	41	45	44
civic organization sponsored adult groups	3	2	9	0

It is interesting to note that in the largest category, that being school groups, the number of programs has decreased over the past four years. Additionally, in all three categories (with the exception of school groups in 1972 and 1973) the number of programs offered is less than the number offered in 1962.

It is also important to denote the changes in the groups that have been served over the past four years. The percentage of preschool (age) groups serviced by the center increased (from 15.5% to 40.1%) as did the non-academic children's groups; e.g. scouts (from 16.7% to 24.9%). Conversely, the percentage of primary school (K-3) groups declined (from 33.9% to 22.6%) as did the intermediate level (grades 4-6) groups (from 27.9% to 10.7%). Other groupings as noted in Appendix 16 basically remained unchanged.

Appendix 20 delineates the monthly fluctuations in numbers of programs presented to groups at the nature center. Each year peaks appear during the spring (April-May) and again in the fall (October-November). Depressions in activity occur yearly in late summer (August) and again in mid-winter (January). These fluctuations seem to coincide with the academic semester periods and the alterations in seasonal weather conditions.

Concerning the grade level of school groups serviced, Ernst (1975) notes that in the early years of the center, the majority of groups were 5th and 6th graders. He indicates, however, that presently the majority of groups are in the preschool through 3rd grade level. This observation is supported by the daily program log data presented below.

	1972	1973	1974	1975
preschool through 3rd	115	136	86	111
intermediate	65	41	23	19

In regards to the above, Ernst (1975) notes that the interests of each of the groups discussed above are basically the same.

Ernst (1975) notes that the center is attempting to reach other academic groups as well (basically 7th to collegiate). One effort being made in this regard is the current project to create a teacher's guide for high school instructors who plan to utilize the center.

The preceding discussion of the clientele has been limited to academic and civic groups. An additionally important segment of the total clientele is the non-grouped clientele, that being the private citizen who comes to the center either by himself, with friends, or with his family, but usually without an appointment.

Only a limited amount of information is available concerning the parameters of this group. It has been the policy of the center throughout the years to give first priority to school and civic groups rather than to the non-grouped visitor. Presently, the center's programs for the latter section of the clientele are limited to weekend films and ad hoc interpretation as the situation permits.

A small amount of data was obtained in regard to the non-grouped clientele. During the fall of 1975, an associate of the author's spent one week at each nature center (Brookside from October 28, 1975 to November 2, 1975; Meadowside from November 4, 1975 to November 9, 1975). The times of maximum-minimum usage by non-grouped clientele were noted as well as the number and age level of this clientele. The data collected during this survey are presented in Appendices 13-15. The reader should not presume that yearly or seasonal data can be extracted from this one week survey. Rather, it reflects only a starting point for additional work.

As can be seen from the data, non-grouped clientele utilized the center most on weekend afternoons. Weekday afternoons after 1:00 p.m. were also used for visitation to a fairly large extent, probably by housewives with young children. Weekday mornings were virtually unused by non-grouped clientele.

The age levels of the non-grouped clientele are presented in Appendix 15. The preponderance of 20-30 year old adults (probably young housewives) in conjunction with preschool children (who could not visit the center alone) results in the largest segment of non-grouped clientele (total of both equals 43.9% of all the non-grouped clientele). The other major segment of non-grouped clientele to use the nature center is that consisting of teenage level children (18.0%).

Plans are being formulated at the nature center to offer better and more thorough facilities and programs for non-grouped clientele in the future. For example, a request has been submitted for funding for two full-time summer naturalists to be utilized specifically for programs given for non-grouped clientele (e.g. scheduled nature hikes, campfire talks, etc.)

Meadowside Nature Center

Facilities. The facilities at the Meadowside Nature Center have not been altered extensively since its dedication in 1972. Rather, any changes in the facilities have usually reflected the developments for the center as provided for in the original plans.

Future facility developments at the center generally fall into the following groups:

- Museum room development (noted on page 58)
- Nature trail development (noted on page 60)
- Pioneer farmstead development (noted on page 60)
- Laboratory development (the goal is to expand the potential sphere of investigations and experimental analysis available to the clientele and staff)

Programs. Nopper (1976) has delineated clearly the transformation of the center's programs through three basic developmental stages. These are outlined below:

1. During the first two years of its existence (1971 and 1972), Meadowside operated as a resource center for basic interpretive programs. As might be expected the use of live animals and nature hikes was strongly stressed.

2. During 1973 and 1974, the nature center attempted to foster an increasingly active participation by local groups (e.g. scouting organizations, garden clubs, etc.) and individuals (e.g. craftsmen, hobbyists, etc.) in the nature center's programs. The center had evolved into what Nopper (1976) calls a "working nature center."

3. During 1975 and 1976, the emphasis at the center slowly shifted in anticipation of the museum hall opening. The "Legacy of the Land" concept became increasingly utilized with human and natural history being

intertwined more thoroughly.

The programs for grouped clientele at the Meadowside Nature Center can be statistically evaluated on the basis of the daily program log (Appendices 17,19,21). As seen in the data presented, the use of live animals in the interpretive package has decreased notably (from 45.3% of the programs to 15.3%) while the use of slide presentations has increased (from 0 to 29.2%). Similarly, the employment of workshops and demonstrations at the center has increased in 1974 and 1975 (from 0 in 1972 to 6.9% in 1975). Nopper (1976) corroborates the above.

Over the past four years, the center has presented group programs which averaged 2.15 activities per group. The most popular combinations of activities have been the hike and film or the hike, film and animal presentation. Each of the following activities is almost always presented in conjunction with some other activity or program: films, nature center tours, and animals.

It is important to note that one of the previously most used activities, that being the use of live wild animals (including the higher forms, e.g. mammals), has been greatly curtailed. This may be due to several reasons, including the difficulties encountered in maintaining these forms in captivity and psychological inhibitions to the captivity program on the part of the clientele. The removal of these higher forms from the laboratory room has facilitated the restructuring of this room from a live animal storage room to a true laboratory. In this regard, Nopper (personal communication 1975) indicated, however, that the center is going to attempt to increase the numbers and diversity of lower forms which are kept in captivity at the center.

Clientele. The clientele at Meadowside Nature Center can, like that at its sister center, be divided into two basic categories: grouped clientele and non-grouped clientele.

The academic class or general age of the grouped clientele was measured over the past four years (1972-1975) by use of the daily program log. The data is presented in Appendix 17. As can be seen, the number of preschool and adult programs has increased over the four year span (11.0% to 25.2% and 8.5% to 18.5%, respectively), while the number of primary and intermediate group programs presented has decreased (16.7% to 6.0% and 18.7% to 8.6%, respectively). Nopper (1976) corroborates the above.

The monthly fluctuations in numbers of programs are presented in Appendix 21. The peaks and depressions in the numbers of programs appear to be approximately the same as those for Brookside Nature Center. It is quite probable that the same factors are controlling the fluctuations at Meadowside as at Brookside.

The results of the one week non-grouped clientele survey for Meadowside Nature Center are presented in Appendices 14-15. It is interesting to note that along with the 20-30 year old adult and preschool group (totalling 32.6%) and the teenage clientele (17.9%), the 40-50 year old clientele also figured prominently in the totals for the non-grouped clientele (latter equals 19.4%).

A SURVEY OF THE PROGRAMS AND FACILITIES AT TWO MONTGOMERY COUNTY, MARYLAND (M.N.C.P.P.C.) NATURE CENTERS

Introduction

Many interpretive researchers (e.g. Wagar 1972a, Cherem et al. 1974, Helmsley 1971, Mahaffey 1968, Cantu 1973, Boulanger and Smith 1973, Field and Wagar 1973, Sapora 1969) have noted the need for evaluation in the field of nature interpretation. Do facilities and programs really have the response they are intended to have? What are the characteristics of the clientele and how can their specific needs be recognized and met? For many years, interpreters have been making empirical observations concerning the success or failure of programs and facilities (e.g. Brown 1940, Tilden 1957). However, statistically based studies which examine the parameters of nature interpretation and nature center facilities are rarely found. Dick et al. (1975), Putney and Wagar (1973), and Washburne and Wagar (1972) corroborate the above. In conjunction with and response to this need, the author devised several survey instruments to obtain information concerning the facilities and programs of the two Montgomery County M.N.C.P.P.C. nature centers.

A review of interpretive literature will demonstrate the sparsity of information concerning techniques to be used for evaluating interpretive facilities. Most of the statistically based studies in the literature (e.g. Mahaffey 1970, Dick et al. 1975, Wagar 1972a, Wagar 1972b, Washburne and Wagar 1972) deal with the evaluation of exhibits and the relative measure of learning which these exhibits can elicit. Of a more general nature, Wagar (1972b) noted that a clear, concise and understandable statement of the nature center objectives is a necessity for any interpretive evaluation effort. If these objectives are not delineated, effective evaluation is stymied (Appendices 5-6). Few manuscripts exist which deal with techniques for preparation of valid and adequate written survey instruments specifically for nature interpretation facilities. Cherem et al. (1974) give some germane information concerning question types to be included for grouped clientele surveys. Additionally, they predict the types of information that can be obtained from specific types of questions. Several U.S. Department of Agriculture Forest Service publications (e.g. Wenger and Gregersen 1964, Hendee et al. 1968, Ross and Moeller 1974) note examples of instruments used for evaluating facilities (other than interpretive ones) under the U.S. Forest Service jurisdiction. Basic information concerning surveys and procedures for their use was obtained from Backstrom and Hursh (1963), Doby (1967) and Glock (1967).

Previous evaluations of the two nature centers in question are also limited. The author encountered only two limited research efforts which had been conducted. The first was a simple questionnaire (Appendix 7) presented to clientele at Meadowside Nature Center. It was entitled "Review of Reactions" and was run from early fall 1971 to early spring 1972. Although over 100 legitimate responses were obtained, unfortunately several critical parameters were not dealt with. For example, the instrument did not obtain the age, sex or educational level of the respondent. Nor was a control obtained. In the author's opinion, only two significant questions were asked on the questionnaire. The first concerned the reason for the respondent's coming to the center. The results are presented below.

Reason	Number	Percent
To walk the nature trail	92	44.7%
To browse	84	40.8%
With a group	65	31.6%
To attend a program	42	20.4%
By chance (but many combined this with other reasons)	35	17.0%
To consult a naturalist	5	2.4%
Other	3	1.5%

In light of the problems discussed in relation to the survey, no data interpretation will be attempted.

A second important question asked concerned which exhibit topics were considered to be the most and least appealing. It was difficult to categorize answers to this section since the respondent had to write the answer in rather than note a specific choice from a list. Nevertheless, a compilation of the data is presented below.

	Most		Least	
Topic	Number	Percent	Number	Percent
Animals	62	54.9%	9	36.0%
History	27	23.9%	10	40.0%
Plants	5	4.4%	5	20.0%
Geology	19	16.8%	1	4.0%

In addition to the problems discussed for the first question, other difficulties were encountered in analyzing responses to this question. Three variables may have influenced responses: (1) the number of exhibits of each type (2) the quality of each individual exhibit and (3) the respondent's interests. Therefore, since the first two variables are unknown, responses cannot be assumed to represent users' interests. Again no data interpretation will be attempted.

A second evaluation of the two nature centers was conducted by Ms. Claudine Wirths, a social psychologist in Montgomery County, Maryland.

During 1971 and 1972, she and her young son (each from their own perspective) evaluated the strengths and weaknesses of 100 parks in Montgomery County, Maryland. Included in their study sites were the two nature centers in question. Unfortunately, the report she submitted was not available for examination either from Ms. Wirths or from the Maryland-National Capital Park and Planning Commission.

It was therefore at this point, and with this precedence from the literature and the local scene, that the author began his attempt to statistically evaluate two of the Montgomery County, Maryland (M.N.C.P.P.C.) nature centers as to their programs, facilities and clientele.

Materials and Methods

Four surveys were prepared during the early fall 1975 in an attempt to evaluate the programs, facilities and clientele of the Montgomery County M.N.C.P.P.C. nature centers in question. The parameters of each of these surveys are discussed below. For each survey, an obviously non-serious response was counted as a "non return" of the survey. A copy of each survey is presented in Appendices 8-12.

1. Non-grouped User Survey. A user survey was prepared for distribution to non-grouped clientele at each nature center during the fall of 1975. The surveys for each of the two nature centers varied only slightly (e.g. only to facilitate minor differences at the sites). At each center the surveys were placed on a large advertisement board (average size of 22 square feet) which was located in a conspicuous area near the entrance to the center. A small (8 1/2" x 11") sign was attached to the door jamb of the main entrance to each center. It contained the following suggestion

for the clientele, "Did you remember to fill out and return your survey?" Survey deposit boxes were located on or close to (within 1 foot) of the advertisement board.

The total run time for the surveys was from October 28, 1975 to January 4, 1976 inclusive. During the first two weeks of the sample period, an associate obtained a one week "control"* sample for each nature center's survey. During this time, she handed out and encouraged participation from as many potential respondents as possible. The numbering of the surveys allowed an evaluation of the percentage return. For the control week at Brookside Nature Center, 87 legitimate responses of the 99 surveys distributed were returned. At Meadowside Nature Center 103 legitimate responses of the 112 surveys distributed were returned. The information gained during these control weeks assisted in determining if the responses obtained during the remaining period of the survey contained inherent bias. During the nine week survey period ("test" period), 100 legitimate responses of the 220 surveys removed from the stacks were obtained at Brookside Nature Center while at Meadowside Nature Center 90 legitimate responses of the 173 surveys removed from the stacks were obtained. Therefore, 63.0% of the total surveys taken were returned with legitimate responses.

2. Teacher and Group Leader Survey (Leaders of Grouped Clientele). A teacher and group leader survey (hereafter referred to as the grouped user survey) was prepared for distribution at each nature center. The surveys, which were identical for each nature center, were given to only one leader for each group. These surveys were distributed from October 28,

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* the terms "control" and "test" groups are utilized to represent the two sample groups as discussed

1975 to January 4, 1976 inclusive. During the week when the author's associate was at the nature centers for the purpose noted above, she handed out the grouped user surveys to the group leaders. During the remainder of the survey period, the staff naturalists at each nature center handed out the surveys to group leaders when it could be conveniently done. A self-addressed, prestamped envelope was handed out with each survey for the respondent's convenience. The author terminated the collection period for the survey on January 16, 1976. The numbering of the surveys once again gave information concerning the percentage of responses. For the Brookside Nature Center grouped user survey, 18 out of 28 surveys were returned. For the Meadowside Nature Center grouped user survey, 12 out of 20 surveys were returned (overall response rate of 62.5%).

3. Naturalist Staff Survey. The author felt that it was critical to obtain the opinions of the staff naturalists in relation to several important concerns and to compare their responses to those from the clientele. To accomplish this goal a naturalist staff survey was distributed to the professional staff at each nature center. The survey was limited to those staff members who were: (1) full-time paid naturalists at the centers (2) part-time paid naturalists at the centers or (3) volunteer naturalists at the centers who were in a collegiate program leading to a bachelor's degree in interpretation or a related field. Additionally, two administrative personnel (the chief and the assistant chief of the M.N.C.P.P.C. Park Interpretation and Conservation Division) were included in the survey. All surveys distributed were returned (100% response rate).

4. Potential User (Non-grouped) Survey. The author was interested in canvassing potential nature center users (non-grouped) to determine their

reasons for using or not using the centers and their opinions concerning the parameters of each facility. To facilitate this goal, a telephone questionnaire was prepared. Telephone calls were made to 98 Montgomery County, Maryland residents selected on a random basis from the telephone directory. This survey was conducted from October 10, 1975 to November 1, 1975. Calls were placed at various times during the day so as to obtain as wide a cross section of county residents as possible. With the exception of three cases, at least 60% of the questions were answered by each respondent. No count was made of citizens who did not wish to participate.

Throughout the analysis of the data, the chi-square test of statistical significance was utilized extensively. This test indicates whether the two variables being compared are independent or related. It does not tell how strongly they are related. If differences between two variables (or two samples on a variable) could have occurred five or fewer times in 100 samples by chance alone (0.05 level of significance), the differences were considered significant. The Fisher's exact test was used in lieu of the chi-square test when the analysis was based on a 2 x 2 (instead of a 2 x C or R x C) contingency table and the responses totalled less than 21. Yates' corrected chi-square was applied for all other 2 x 2 tables. The Statistical Package for the Social Sciences computer program utilized (Nie et al. 1975) stipulated the above limitations.

In presenting the data, when responses totalled 50 or more on any one question, the percentage of total responses (for that question) is cited (cases of non-response to a particular question are not considered in the analysis). In discussing questions which received less than 50 responses (as is the case in both staff and grouped user surveys), absolute frequencies are used in lieu of percentages in order to avoid misleading statements.

Results and Discussion

Users: Non-grouped Clientele

Control and Test Groups. A chi-square test was run to detect any response bias in the test groups (e.g. whether those with strong feelings in favor of, or against, the nature center and its activities were more likely to fill out a survey on a completely voluntary basis). During the initial test, a significant difference between responses of the control and test groups was detected in 5 of the 27 questionnaire items* used on the Brookside survey [age, occupation, reason(films), reason(visit nature center), activity(films)]. Only one (age) of the 32 items used on the Meadowside survey was significant (Appendix 22).

Upon examination of the contingency tables for age, it was discovered that two categories accounted most for the variability between control and test groups: 8-12 years and 60 or over. On a voluntary basis, many more 8-12 year olds filled out surveys (31:6) while fewer elderly persons filled out surveys (1:7). On the basis of these findings, a second chi-square analysis was made excluding all cases where age equalled 8-12 years (Appendix 23). With this exclusion, only 3 of the total 60 questionnaire items showed a significant response difference [reason(films), activity (films) on Brookside survey and activity(library) on Meadowside survey]. At the 0.05 level, 5% of the cases (3 of 60) may be significant due to chance alone. Consequently, the decision was made to combine the control and test groups but to exclude the 37 surveys received from 8-12 year olds. All further statistical analyses were performed on this basis (165 surveys at Brookside and 178 at Meadowside).

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* the questionnaire item rating the staff was excluded since users may have thought that the person handling the surveys was a staff member

A chi-square analysis was also performed to determine response differences between non-grouped clientele at Brookside and non-grouped clientele at Meadowside for each questionnaire item (Appendix 28). Any statistically significant responses are noted in the following discussion.

Characteristics. Those between the ages of 13 and 39 accounted for 78.6% of the clientele responding at Brookside and 70.9% of those responding at Meadowside (Appendix 24). Users were fairly evenly distributed within this range. As age increased beginning at age 40, there was a continuous decline in the number of users at each nature center. A very small percentage of the non-grouped clientele was 60 or over (3.7% at Brookside and 5.7% at Meadowside).

Appendix 15 shows that during the control weeks, the majority of non-grouped clientele visiting both nature centers were below 20 years of age. A substantially large group of clientele, those below age 13, are not represented in this survey. However, this survey does support the conclusion that most of the non-grouped clientele are young people (under 30 years of age).

Sex ratios of respondents at the two nature centers were significantly different ($P<0.05$). Males and females were nearly equally represented on the surveys received at Meadowside (47.3% and 52.7%, respectively) while at Brookside 64.7% of the respondents were females. This may be a reflection of the relatively large number of young mothers who visited Brookside with preschoolers. Their greater frequency at Brookside may be due to that center's greater accessibility, and also, the center's more diverse natural history exhibits (the taxidermy mounts may be especially appealing to preschoolers).

Clientele generally appear to be well educated. A notable 21.7% at

Brookside and 23.0% at Meadowside hold graduate degrees. Almost half of the respondents (48.4% at Brookside, 41.4% at Meadowside) have not completed college. However, of the non-teenage adults, only 31.1% and 20.3% respectively have not completed college.*

Non-grouped clientele were divided into five occupational categories. It is interesting to note that even when 8-12 year olds were excluded, students constituted about one-third (34.2% at Brookside, 29.4% at Meadowside) of this clientele. Professionals formed the largest category at Meadowside (41.2%) and the second largest category at Brookside (32.9%). Housewives accounted for 21.1% of the respondents at Brookside.

Parameters of Nature Center Visit. More than eight out of every ten persons visiting either Brookside or Meadowside (excluding those who were part of a school or scouting group) were accompanied by either a family member and/or a friend. Those coming with at least one other family member formed about 60% of the total non-grouped clientele. Therefore, the small family group appears to be a very important component of nature center users.

At both nature centers, the largest category of users travelled from 3-5 miles. Less than 8% lived within walking distance (1 mile) of the nature center they were visiting. This may reflect the mobility of suburban residents and for Meadowside its location on the edge of suburbia. The author feels that some nature centers are local enterprises and have primarily very localized clientele (e.g. the Maydale Nature Center, Burtonsville, Maryland and the Charleston Community Nature Center,

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* These figures do not include cases of eight persons who did not respond to the question concerning educational level. Two were teenagers who may not have finished 8th grade. The remaining six gave some indication of completing at least the 8th grade.

Charleston, Illinois). Other centers have a broad base of operations, a resulting wide sphere of influence, and thus, a clientele more cosmopolitan in nature. Brookside and Meadowside tend to be in the latter category.

Nearly three-fourths (75.9% at Brookside, 72.0% at Meadowside) of those surveyed had made at least one previous visit to the same nature center within the last 12 months (Appendix 24). A relatively large number are regular visitors as indicated by the 30.2% at Brookside and the 28.0% at Meadowside who had made five or more previous visits within the last year. These data indicate that the majority of non-grouped clientele at the two Montgomery County nature centers are either occasional/first-time visitors (0 previous visits within the last year) or very frequent visitors (5 or more previous visits within the last year).

Users were asked to check the major reason(s) for their visit, and thus, they could check any number of the specified reasons. There were an average of 1.68 of the 8 possible responses checked by each person at Brookside and an average of 1.46 of the 9 possible responses checked by each person at Meadowside.

Responses cited by Brookside users as opposed to Meadowside users were statistically different for five of the major reasons listed for visiting both nature centers (Appendix 28). Significant response differences were obtained for the following: watching a film ($P<0.025$), looking at the exhibits ($P<0.005$), using the self-guided nature trail ($P<0.005$), just visiting a nature center facility ($P<0.025$) and other ($P<0.05$).

The most popular single reason for visiting Brookside was to look at the exhibits (mentioned by 45.4% of the respondents). This may be indicative of user expectations and/or their high degree of satisfaction with the exhibits. An almost equally chosen reason was "just to visit a nature center facility." Brookside's convenient location may encourage this. Far down the scale but cited as the next most popular reasons were the self-guided nature trail (25.8%) and the films (20.2%).

The majority (55.6%) of persons visiting Meadowside came in order to use the self-guided nature trail. This may reflect user expectations and/or the strong staff priority placed on experiencing the environment as opposed to learning about it indoors. It may also be influenced by the extensive system of trails and large acreage owned by the center. Other notable responses listed in order of frequency cited were "just to visit a nature center facility" (27.5%), to look at the exhibits (19.7%) and to watch a film (10.7%). "Other" was a popular response with a 23% selection rate. This may be due to the number of persons (13 of the 41 in this category) coming to Meadowside just to hike (on other than the self-guided nature trail) and/or birdwatch.

Over 90% of the total non-grouped clientele at Brookside and Meadowside indicated that they were either "very satisfied" or "satisfied" with their visit in relation to their aspirations (Appendix 24).

Participation in Nature Center Activities and Programs. Non-grouped clientele at the two nature centers had on an average participated in 2.28 of the 5 activities listed on the Brookside survey and 2.36 of the 6 listed on the Meadowside survey. At Brookside, the number of users who had performed each activity corresponds directly with reasons cited for visits. Eighty-eight point seven percent (88.7%) had looked at the exhibits, 64.8% had hiked on the self-guided nature trail and a little over half (52.2%) had viewed a film(s).

Frequency counts at Meadowside resulted in the same order. Over three-fourths (77.7%) had looked at the exhibits while nearly as many had utilized the self-guided nature trail (71.7%). Nearly half (48.2%) had watched a film(s) and 22.3% said they had "used" the library. The only one of these activities receiving a significantly different response rate at the two centers related to the exhibits ($P<0.025$).

Less than 6% of the non-grouped clientele had ever participated in the special interest clubs and programs sponsored by the nature centers. However, the author does not feel that these data are indicative of the relative measure of success of these programs.*

Most and Least Popular Activities. Visitors were requested to designate one of the activities which they found to be most "stimulating and enjoyable" and one found to be least "stimulating and enjoyable." Chi-square analyses revealed a significant response difference between Brookside and Meadowside users for both questionnaire items (most-liked activity, $P<0.005$; least-liked activity, $P<0.005$; Appendix 28). Variability in selection rates for both the self-guided nature trail and the exhibits was the primary factor affecting the significant chi-square value for the most popular activity. No one factor could be isolated to explain variability in selection of a least-liked activity.

The order of those activities ranked at Brookside as most popular is identical to that of the activities most performed, and also, cited most frequently as reasons for a visit (exhibits, self-guided nature trail, films; Appendix 24). At Meadowside, the only noteworthy response to most-liked activity regarded the self-guided nature trail (69.7%).

* since these programs are very specialized in their scope of operations, they are not designed for a wide spectrum of clientele but rather for select and resultingly small groups

It may be of interest to note that 65.5% of those using Meadowside's self-guided nature trail rated it as "very good" in contrast to the 32.5% who attributed the same favorable rating to Brookside's trail (statistically significant, $P<0.005$). This implies an overwhelmingly favorable response to the self-guided nature trail at Meadowside but not to the exhibits there (the exhibit hall is presently incomplete). The above data may also reflect visitor knowledge of the total sphere of activities available at the two nature centers.

Less than 30% of the surveys offered a response to the least "stimulating and enjoyable activity" question. The guided tour and films were mentioned most frequently at Brookside while the library and films were noted most often at Meadowside. These data concerning least-liked activities may reflect clientele disposition against the activity rather than actual participation and resulting dissatisfaction (e.g. a total of 15 respondents at Brookside had participated in a guided tour, but 19 respondents cited it as the least-liked activity!).

Visits to Other Nature Centers. A majority of users had made previous visits to Rock Creek Nature Center in Washington, D.C. (6 miles from Brookside, 10 miles from Meadowside; Appendix 24). Twenty-one point eight percent (21.8%, Brookside) and 38.8% (Meadowside) had been to Catoctin Nature Center in Thurmont, Maryland (50 miles from Brookside, 43 miles from Meadowside).* Over one-quarter (27.3%) of the Brookside users had visited Meadowside while nearly two-thirds (63.5%) of the Meadowside users had visited Brookside (this may be due to the relative newness of Meadowside in relation to Brookside). Few persons had ever been to either of the Prince George's County, Maryland* nature centers. Therefore, there is reason to believe that a substantially large core of the non-grouped clientele at both Brookside and Meadowside consists of regular nature center visitors. However, this group may be hesitant to travel around the Washington metropolis to visit other suburban nature centers.

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* statistically significant ($P<0.005$)

Users: Grouped Clientele (based on 18 surveys at Brookside and 12 at Meadowside)

Since these surveys were completed only by group leaders and not group members, responses indicate each leader's perception of his group's needs, interests and levels of satisfaction (Appendix 25). In comparing the responses received at Brookside with those received at Meadowside (Appendix 29), responses to each question were divided into two categories to avoid small cell frequencies which would violate the assumptions of the chi-square test.**

Characteristics. Group leaders completing surveys at the two Montgomery County nature centers accompanied children ranging in grade level from preschool through intermediate. Primary-aged groups formed the largest category of grouped clientele at each nature center. No other grade levels were represented in this survey. This is consistent with the data presented in Appendices 16-17 which show that during the four year period from 1972 through 1975 junior high through college groups constituted less than 6% of the total grouped clientele at each nature center.

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* an adjacent suburban Washington, D.C. county

** The expected number in any class should not be less than one (Snedecor and Cochran 1967)

There was a significant difference in types of groups represented at each nature center ($P<0.025$). Thirteen of the 17 group leaders responding at Brookside led school groups (as opposed to scouting groups) with one of these groups consisting of handicapped children. This may reflect the top priority given by staff members to school groups. Two-thirds of the groups visiting Meadowside were scouting groups while two of the three school groups were composed of handicapped children. Data collected from 1972 through 1975 (Appendices 16-17) support the fact that scouting groups constitute a higher percentage of the grouped clientele at Meadowside than at Brookside. The extensive system of trails at the former may be especially attractive to scouting groups. The significant difference in types of groups at each nature center resulted in a significant difference ($P<0.01$) in average group size (23.4 persons at Brookside, 12.2 persons at Meadowside).

Parameters of Nature Center Visit. The majority of groups travelled from a home base located within 10 miles from the nature center visited (Appendix 25). Very few (2 of the 30 total) travelled over 20 miles.

Group leaders were asked to note the frequency with which they visited the nature center. Two-thirds of the group leaders at Brookside indicated that they made annual visits to that center while at Meadowside responses were nearly equally distributed between the three categories (first visit, made an annual visit, or visited the center more than once a year).

The majority of the 18 groups at Brookside:

— visited the nature center in conjunction with a particular unit of study (14)

— had been presented with a preparatory lecture or pre-test (10)

— would undergo no written evaluation (11).

At Meadowside, as expected, the majority of the 12 groups:

-- did not visit the nature center in conjunction with a particular unit of study (6)

— had not been presented with a preparatory lecture or pre-test (7)

— would undergo no written evaluation (8).

Participation in Nature Center Activities. Groups generally participated in more activities at Brookside (3.39 of the 7 specified) during their visit than at Meadowside (2.58 of the 8 specified). All groups visiting Brookside looked at the exhibits. About three-fourths watched a film and nearly as many were led on a guided tour. Notable responses to activities performed by Meadowside groups (in order of decreasing frequency) were as follows: film, exhibits, self-guided nature trail and guided walk, guided tour. Brookside groups differed significantly from Meadowside groups in that they looked at the exhibits more often ($P<0.01$) and were led on a guided tour more often ($P<0.005$; Appendix 29). It may be of interest to note that the guided walk was utilized and/or preferred over the guided tour at Meadowside while the opposite was true at Brookside. This preference is substantiated by the program log data from 1973 through 1975 presented in Appendices 18-19.

Most and Least Popular Activities. Two-thirds of the group leaders specified a most-liked activity while only 12 (of the total 30) specified a least-liked activity (Appendix 25). For purposes of analyses (not on the survey itself), activities were differentiated according to the following: sedentary vs. active, inside vs. outside, staff involvement vs. no staff involvement (see Appendix 49 for specific activities placed in each category). A significant difference between responses at the two centers was obtained for the most-liked activity when divided according to inside vs. outside ($P<0.01$). The reason for this becomes apparent in the discussion below.

At Brookside, in regard to the most-liked activity, the guided tour was the only noteworthy response, with 6 of the 12 respondents indicating this as a group favorite. Fourteen of the 16 leaders of groups led on a guided tour or walk rated it as very beneficial to their groups. Twelve of these felt that the staff member leading them was very well prepared. Brookside's self-guided nature trail was not mentioned as being most-liked by any of the 8 groups utilizing it. In fact, it was cited most often (3 of 7 responses) as the least "stimulating and enjoyable" activity.

Half of the respondents at Meadowside (4 of the 8) designated the guided walk as their group's favorite activity. Four of the 7 participating in the guided tour or walk rated it as very beneficial while 5 of these felt that the naturalist was very well prepared. Library use was chosen most frequently (3 of the 5 responses) for the least-liked activity.

The above data further indicate the popularity of the guided tour among Brookside's grouped clientele and the popularity of the guided walk among Meadowside's grouped clientele.

Objectives of Group Leaders. Group leaders were asked to specify the learning objectives they had for their groups in relation to their visit. The most frequently cited objective (8 of the 23 responses) concerned the development of observational skills (e.g. identification of flora and fauna). No other response was commonly offered (Appendix 46).

Staff (based on 9 surveys at Brookside and 8 at Meadowside)

Responses of the two central administrators (M.N.C.P.P.C.) were included with data for both of the nature centers.

Characteristics. Data concerning staff educational levels and experience in the field of nature interpretation are presented in Appendix 26.

Perception of Clientele Interests and Needs. In their responses, staff members were not asked to distinguish between grouped and non-grouped clientele. Staff members were asked to select what they thought to be the major reason people visited their nature center. Only 2 of the 8 possible reasons for clientele visits were noted by staff members. Among Brookside staff, 7 members felt that most visitors came "just to visit a nature center facility" while two cited guided walk/tour as the major reason for a visit. Meadowside staff members suggested the same two reasons but in opposite order (5 cited guided walk/tour, one cited "just to visit a nature center facility").

In answer to the question of the activity "most stimulating and enjoyable to most people," staff members at both nature centers were very consistent. Two-thirds (6 at each center) selected the guided walk. Films and exhibits were each mentioned once at Brookside while the self-guided nature trail was mentioned once at Meadowside.

In reference to the "least stimulating and enjoyable" activity, three Brookside staff members quoted films while four Meadowside staff members cited exhibits (Appendix 26).

In regard to the above three questions, the responses of the individual staff naturalists at each center appear to be quite uniform. In comparing responses between the two centers, only two questionnaire items received significantly different response rates. Both were in relationship to the major reason for visits to the centers (guided walk/ tour, $P<0.025$; "just to visit a nature center facility," $P<0.05$; Appendix 30).

From the frequency with which guided walk/tour is cited, the author presumes that staff members at both Brookside and Meadowside consider their largest and/or most important clientele to be the grouped clientele.

Potential Users (based on 98 surveys)

Characteristics. The largest categories of persons answering the calls were those 60 or over (33.3%) and those between 30 and 39 years of age (23.0%; Appendix 27). Teenagers represented the smallest percentage (1.1%) of respondents. Seventy-eight point one percent (78.1%) of the respondents were females. Over half had not completed college (55.1%), while 15.7% held graduate degrees. Occupationally, the largest group contacted consisted of housewives (33.3%), while the smallest consisted of students (8.3%).

Persons were asked to give a major intersection located near their home. From this information, distances from both of the nature centers were derived. Distances represent a straight line measurement rather than actual road mileage. The average distance from Meadowside (7.1 miles) was greater than the average distance from Brookside (5.7 miles).

Knowledge of the Brookside and Meadowside Nature Centers. More of the respondents had heard of Brookside (36.7%) than Meadowside (12.5%). This was expected due to the more centralized location and longer existence of the former. Nearly half of the respondents (17 of 36) had learned about the nature center "through friends, neighbors, relatives or family." Of the 36 who had heard of Brookside, 19 had visited the center, while at

Meadowside the ratio was 12:5. Lack of available time was most often mentioned as the reason for not visiting the centers (7 of 17 responses).

Persons who had heard of either nature center (41 total) were asked to indicate which of the programs and activities sponsored by the centers they were "aware of, or familiar with." Of the 11 potential responses, only 6 were noted. Exhibits (19) and self-guided nature trail (17) were indicated most frequently.

Perception of Nature Centers in General. Respondents were asked to indicate whether they agreed or disagreed with four statements about nature centers. At least 78% responded to each statement correctly (Appendix 27). The greatest variance in response concerned whether or not nature centers were mainly for "people who have a lot of free time." Due to the frequency of correct perceptions, no one problem area was revealed.

Most and Least Popular Topics. Potential users were asked which one of the following topics they were most interested in: plants, animals, geology, general ecology, environmental problems, climatic and weather conditions, pioneer life, none of the above. Exactly 50% were most interested in plants, while 20.5% were most interested in animals. Eleven point four percent (11.4%) indicated that they were not interested in any of the topics listed. It may be important to note that pioneer life, along with geology, was mentioned least often in this category (2.3%).

The three topics mentioned most frequently as least interesting were: climate and weather (29.2%), geology (19.1%) and pioneer life (14.6%). A general interest in animals is indicated since it was the only topic not cited by any person as being least-liked.

Responses of Various Groups (Samples) to the Same Question

Characteristics of Non-grouped Users vs. Potential Users. For purposes of comparison with potential users, surveys from the non-grouped clientele at the two centers were combined (Appendix 31; as noted previously, sex was the only one of the four demographic characteristics statistically significant). Non-grouped clientele and potential users differed significantly according to age, sex and occupation. The age difference ($P<0.005$) resulted from the low number of telephone calls answered by teenagers and the high number of telephone calls answered by the elderly. The difference in sex ($P<0.005$) resulted from the high number of females answering calls. All five occupational categories apparently contributed to the significant difference in occupation ($P<0.005$).

In comparing potential user survey data with 1974 census update information obtained from the Montgomery County Planning Board (Appendices 35-36), it became apparent that the respondents to the telephone survey may not represent a random sample of the Montgomery County residents. This may, in part, be due to the greater probability of certain segments of the population (e.g. housewives, elderly, unemployed) being at home when telephone calls were placed and certain segments of the household being more inclined to answer the telephone.

In order to draw more valid conclusions about the types of persons who tend to visit the two nature centers, the survey results from the non-grouped clientele were compared to the census update information for Montgomery County (Appendices 32, 35-37). Only data pertaining to those over 19 years of age were utilized in this comparison (since age categories for teenagers were different in this survey from those used in the Montgomery County census data). There was a significant difference between Montgomery County residents and both Brookside and Meadowside non-grouped users according to age (Brookside, P<0.005; Meadowside, P<0.005). In both cases, this was primarily due to the large percentage of center clientele between the ages of 30 and 39, and also, the small percentage of clientele over 49 years of age (Appendix 35). The latter may result from a failure of the nature centers to attract the elderly and/or a decreased mobility in this age group.

Sex ratios of non-grouped clientele in comparison to Montgomery County residents differed significantly only for Brookside users (P<0.025). With relation to the general population, a large number of females visited Brookside (probably due to the number of housewives who visited with small children; Appendix 36). Visitors to Meadowside generally represented the sex ratio of the population norm.

Non-grouped clientele at both nature centers were highly educated. Fourty-one point eight percent (41.8%) of Montgomery County residents (over 24 years of age) had completed college in comparison to 68.9% (over 19 years of age) at Brookside (P<0.005) and 79.7% (over 19 years of age) at Meadowside (P<0.005; Appendix 37). Therefore, it can be concluded that both Brookside and Meadowside tend to attract a young, highly educated segment of the general population.

Occupational information from the census update could not be compared to survey data since the two utilized dissimilar occupational categories.

Activities Performed and Most/Least-liked by Non-grouped vs. Grouped Clientele. Both non-grouped and grouped clientele were asked to check activities performed at the nature centers. Two small differences between the questions posed to each clientele type should be mentioned.

First, group leaders were only to check activities performed by their group during that particular visit while non-grouped users checked all activities they had ever participated in at that nature center. Second, group leaders were given two additional options to check: "hiked on other nature trails" and "other."

A comparison of activities performed by non-grouped and grouped users (Appendix 38) indicates that the two clientele types tend to perform similar activities. The only significant differences between the clientele concern the two activities reserved exclusively for grouped users. There was a significant difference between responses of the two types of clientele in relation to the guided tour at Brookside ($P<0.005$) and the guided walk at Meadowside ($P<0.005$). This was due to their popularity as group activities at the respective centers.

In comparing responses for most and least-liked activities, the three categorizations shown in Appendix 49 were utilized. The only significant differences between the clientele on the question of most-liked activity again was influenced primarily by the guided tour and walk. In regard to a favorite activity, grouped users at both nature centers selected an activity involving a staff member more frequently than did non-grouped users (Brookside, $P<0.005$; Meadowside, $P<0.005$). The above was probably due to the popularity (among grouped clientele) of the guided tour at Brookside and the guided walk at Meadowside. Watching a film is the only activity (of those listed) involving staff supervision that is available to non-grouped clientele, whereas, all three such activities are available to groups.

A significant difference between activities selected as least popular was found between the Brookside clientele ($P<0.01$). Grouped users more often selected an activity not involving a staff member (all but one response to this question by group leaders concerned the exhibits and the library).

Staff Accuracy in Predicting User Responses. Staff members were asked to check what they thought to be the major reason for visits to their nature center. As noted previously, they were not asked to distinguish between grouped and non-grouped clientele. These data were compared to responses by non-grouped clientele to the same question (Appendix 39). Users, unlike staff, were not limited to one response. The naturalist staff selected only two reasons: guided tour or walk and "just to visit a nature center facility." Thus, none even mentioned the reason cited most frequently by non-grouped clientele for visiting each nature center (exhibits at Brookside, $P<0.025$; self-guided nature trail at Meadowside, $P<0.05$).

Staff and non-grouped clientele responses for most-liked activity differed greatly* since two-thirds of the staff members at each center had selected the guided walk (not even available to non-grouped clientele). The author believes that the significant differences (cited above) between responses of staff members and non-grouped clientele support the presupposition that the staff members envision grouped clientele as being their largest and/or most important clientele type. The frequency with which the guided walk was cited by staff members makes it apparent that their comments are mainly directed to grouped clientele.

Responses of staff members were then compared to those of group leaders

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* statistically significant difference at both nature centers when differentiated according to whether the activity called for staff involvement or not (Brookside, $P<0.005$; Meadowside, $P<0.005$)

(Appendix 40). Six of the 8 Brookside staff members responding felt that the guided walk was the "most stimulating and enjoyable to most people." However, only one of the 12 group leaders responding selected the guided walk as most-liked while 6 selected the guided tour. This resulted in a significantly higher percentage ($P<0.01$) of staff members (as compared to group leaders) who cited an outside activity (as compared to an inside activity). As stated previously, only 4 of the 18 groups visiting Brookside (22.2%) had been led on a guided walk. Appendix 18 shows that over the four year period from 1972 through 1975 only 22.8% of the groups visiting Brookside (and having a specific program) had gone on the guided walk. Therefore, it seems quite unlikely that the grouped clientele would have chosen the guided walk most frequently as a favorite activity (of the five listed). Brookside staff apparently tend to overrate the importance of the guided walk in their overall program.

Responses between staff and grouped clientele at Brookside did not differ significantly in relation to least-liked activity.

The activity most frequently chosen by both Meadowside staff and group leaders as the most popular was the guided walk. It should be noted that 68.4% of all groups visiting this center from 1972 through 1975 (and having a specific program) had been led on a guided walk (Appendix 19). Most staff and group leaders also agreed upon the exhibits and the library as being least-liked. Based on these data, it appears that Meadowside staff members generally have an accurate perception of grouped clientele interests.

Associations Between Responses to Different Questions on the Same Survey

The chi-square test was used in order to determine any significant relationships between responses to various questions on the same survey. Chi-square values significant at the 0.1 level are cited in the discussion below in order to substantiate statements based on chi-square values significant at the 0.05 level (Appendices 41-43).

Users: Non-grouped Clientele. The demographic characteristics of age, sex and education were compared to reasons for nature center visits, activities performed, and activities most and least-liked (Appendix 41). Two suitable groupings could not be devised to categorize the five occupational types as noted on the survey, and thus, many of the chi-square values involving occupational types were invalid. Reasons for visiting the nature centers apparently were not influenced by either sex or educational level. However, age was a significant factor among Brookside non-grouped clientele. As age increased, the percentage of those coming in order to look at the exhibits increased ($P<0.05$), while the percentage of those coming for other reasons (than those cited) decreased ($P<0.05$).

Activities performed at the nature centers did not vary in relation to age, sex or educational level. The only exception regarded the guided tour and walk which may be related to age and education due to their nature as group activities (the author presumed that non-grouped users who had participated in a guided walk or tour had done so as a member of a group on a previous visit). Age was the only one of the three demographic characteristics which had a significant affect on most and least-liked activities at either center. Older persons at Brookside tended to favor less active ($P<0.05$), inside ($P<0.1$) activities.

A series of tests was run in order to determine whether the number of previous visits to the nature centers within the last 12 months was related to the distance from the centers, reasons for visits, most and least-liked activities, or the number of visits to other nature centers (Appendix 41). As expected, the number of visits decreased as the distance from the center increased (Brookside, $P<0.1$; Meadowside, $P<0.025$). At both nature centers, the reasons for visits were related to the number of visits. People who had been to Brookside more than two times (within the last year) cited the films ($P<0.005$) and the exhibits ($P<0.005$) as reasons for their visit more frequently than those who had not visited as many times. Similarly, non-grouped clientele at Meadowside who had visited more than two times cited the films ($P<0.005$) and the self-guided nature trail ($P<0.1$) more often than those who had not visited as many times.

Most-liked activities varied according to the number of visits to Meadowside but not Brookside. At the former, persons returning to the center more often, favored more active ($P<0.025$), outside ($P<0.01$) activities. Persons returning more often to both centers, also visited several other nature centers more frequently. In particular, frequent Brookside visitors had been to Meadowside ($P<0.1$) more often than non-frequent visitors while frequent Meadowside visitors had been to Brookside ($P<0.025$), Catoctin ($P<0.01$), and Rock Creek ($P<0.1$) more often than non-frequent visitors.

Finally, reasons for visiting the nature centers were compared to the level of satisfaction obtained. No relationship between the two was revealed.

Users: Grouped Clientele. The grade level (preschool vs. older) and the type of group (school vs. scouting) were not found to be significantly related to any of the following (Appendix 42):

- — whether the visit was in conjunction with a unit of study
- — whether a "preparatory lecture or pre-test" was presented before the visit
- — whether the group would undergo a written evaluation after the visit
- — the total number of activities performed by the group
- — the most and least-liked activities
- -- how well the group leaders' objectives were fulfilled.

In comparing the grade level and the type of group with activities performed, the only significant relationship found was between the type of group and participation in the guided walk (at Brookside only; Appendix 42). Scouting groups visiting Brookside were led on the guided walk more frequently than were school groups ($P<0.025$).

Potential Users. The age, sex and education of those contacted by telephone were compared to the following (Appendix 43):

- — whether the respondent had heard of either nature center
- — whether the respondent had ever visited either nature center
- — the most and least-liked activities.

The only significant relationships found among the above involved education. As the educational level increased, the percentage of respondents who had heard of Brookside increased ($P<0.01$) and the percentage of respondents who had visited Meadowside also increased ($P<0.05$).

There was no significant relationship between the distance from the nature centers and knowledge of, visits to, or method of learning about either center. Similarly, there was no significant relationship between either most and least-liked topics and whether the respondents had ever visited the nature centers.

Recommendations

Inherent to the rationale for user/potential user surveys and clientele evaluation is the development of recommendations for alteration in the policies, procedures and/or facilities of the nature centers in question. As a result of this study, the author has determined that certain recommendations should be presented. These recommendations are delineated below. The author understands that monetary, physical, sociological, or other factors may critically limit the pursuit of the modifications as presented. Furthermore, it should be understood that this survey only delineates information concerning clientele utilizing the nature centers during one fall to early winter period. The recommendations and results thus should not necessarily be presumed to be valid beyond the scope as outlined above.*

1. It appears that both nature centers are investing their primary resources into reaching grouped clientele. The author is not suggesting that this is an incorrect strategy, but rather that the resulting disparity between grouped and non-grouped clientele services should be recognized and rectified if possible. Non-grouped clientele presently receive only

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* The time limits of the author necessitated the experimental approach as outlined. Where, however, a more comprehensive survey is desired (e.g. in which generalizations could be made concerning "normal" clientele for different seasons), a plan delineated by Dr. C. Nelson (personal communication 1976 from Dr. C. Nelson, University of Maryland, College Park, Maryland) should be considered. This plan utilizes 1-2 days selected on a random basis each month in which grouped and non-grouped clientele are surveyed. Under this plan a staff naturalist should devote his total occupation during these days to eliciting responses from as high a percentage of clientele as possible. This report documents the fact that these periods of elicited response gain large numbers of unbiased data. Thus, in the proposed test, minimal staff time allotments would result not only in large numbers of responses but additionally in a survey from which conclusions could be drawn for periods over a total 12 month span.

minimal personal contact with the staff naturalists. Their basic source of interpretation comes from self-guided nature trails, exhibits, and on the weekend, films. The above seems to be substantiated by data gleaned from the non-grouped user survey. At Brookside 21 of 109 comments concerned the lack of personal contact with the naturalists, while at Meadowside 11 of 91 comments dealt with this (Appendices 44-45). The majority of non-grouped clientele visit the nature centers on weekends (Appendices 13-14). Therefore, it would appear that an increase in the naturalist staff present on weekends might help rectify this problem. Guided building tours and naturalist led hikes could be given at specified times throughout the weekend. Other potential solutions to this problem are presented in the literature. At the Rock Creek Nature Center in Washington, D.C. (Chick 1964) a naturalist is situated near the entrance to greet clientele and answer questions. Wagar (1972b) suggests that one way to give a certain amount of personalized service to non-grouped clientele on the self-guided nature trail (while keeping staff time investment to a minimum) is to station a naturalist near the start of the trail where he could hand out trail guides and answer questions while continuing with other duties.

2. It appears that the nature centers in question are not adequately attracting certain segments of the population. The author feels that this might be occurring, not because of a lack of interest by these groups, but rather because of other inherent problems. These groups are listed below, along with suggestions for increasing participation from them.

a. The Elderly. Presently, the nature centers reach only a small percentage of this age group. This problem is substantiated through an examination of non-grouped user survey data (Appendix 35). The elderly (over 59 years of age) constitute 5.0% of Brookside's and 7.8% of

Meadowside's non-grouped clientele (of those over 19 years of age). This is in marked contrast to the Montgomery County, Maryland citizenry in which 17.9% of the population (of those over 19 years of age) are over 59. Additionally, the problem is noted by the M.N.C.P.P.C. naturalist staff (Appendices 47-48). Four of 17 responses noted the elderly as being a segment of the population presently not being reached. Initial steps in improving this situation could be: (1) to provide public transportation for the elderly to the nature centers and (2) to increase the quantity and quality of those activities (sedentary and otherwise) which are especially attractive to the elderly.

b. Upper Level Academic Groups. The nature centers have generally been unable to attract academic groups other than those from the preschool, primary and intermediate grade levels. Junior high through college level classes have characteristically not used the centers for grouped academic endeavors (Appendices 16-17,25). However, initial steps have been taken to reach these groups. For example, a senior high teacher's guide is being prepared at Brookside. Similar innovative plans and programs need to be devised to attract a wide spectrum of post elementary aged school groups.

c. The Handicapped. Although both nature centers in question have given programs for the mentally and physically handicapped, neither has specifically designed facilities for their use. The naturalist staff is well aware of this problem. Eight of 17 responses noted the handicapped as being a segment of the population presently not being reached (Appendices 47-48). The staff and author concur that trail, building and program modifications, as well as public transportation to the nature centers, could be effective in rectifying this problem.

3. The data collected seem to indicate that certain alterations need to take place in the exhibits present at both nature centers. Generally, this is substantiated by the fact that 60 out of 200 non-grouped clientele recommendations concerned exhibit modification (Appendices 44-45). Suggested changes in the exhibits are presented below.

a. More sensory exhibits are needed. Sensory exhibits are especially needed to stimulate young children. The success of these exhibits with young children is readily evident at nature centers where they are featured (e.g. Rock Creek Nature Center in Washington, D.C. and Watkins Nature Culture Center in Upper Marlboro, Maryland). Without them, the exhibit hall may tend to embody a sense of sterility. The taxidermy mounts present at Brookside help in this respect by allowing children to feel and examine natural items at close range. Perhaps their inclusion at Meadowside will be a first step in this regard. The smaller percentage of housewives and preschoolers visiting Meadowside (as compared to Brookside) may result, in part, from the total absence of sensory exhibits at the former.

b. The quantity of exhibits at both nature centers may need to be increased. At Brookside 10 of 39 non-grouped user recommendations dealing with exhibits concerned this need for increased quantity, while at Meadowside 18 of 21 noted the same (Appendices 44-45). At Brookside this may be impossible unless more floor space is provided through capital construction. At Meadowside the completion of the museum room should neutralize at least a certain percentage of these requests.

c. The exhibits at Brookside need to be changed periodically. This concept, which is presented throughout the literature (e.g. Ashbaugh 1973, Reid n.d., Chick 1964, Cherem et al. 1974, Gabrielsen and Holtzer 1965) is substantiated by data obtained from the non-grouped user survey at Brookside (Appendix 44). There, 16 of 39 comments concerning the exhibits stipulated the need for change. Meanwhile, at Meadowside, a relatively new facility, no comments (of 21 presented with regard to the exhibits) dealt with the need for change. A significant portion of the non-grouped clientele at Brookside Nature Center are repeat visitors (75.9% had made at least one previous visit during the last year; Appendix 24). Thus, they would be exposed repeatedly to the same exhibits and internal format. In this regard, Field and Wagar (1973) suggest that seasonal displays should be incorporated into the inside facilities package, especially for the benefit of repeat visitors. Two Brookside non-grouped respondents noted this need rather forcefully by writing the following.

> Change the exhibits more than once every 10 years.
>
> PLEASE. The exhibits need a change, they've been the same for a very, very (a couple of years) long time. It's really getting boring!

d. The extensive exhibits at Meadowside dealing with the history of the land may constitute a more sizable investment of the center's facilities than visitor interests warrant. A large percentage of the materials inherent to this part of the interpretive facility could be classified as "inert." Wagar (1972b) notes that inert exhibits elicit the lowest amount of visitor interest. Data obtained from potential users substantiate the above (Appendix 27). Only 2.3% of the respondents felt that human history was their favorite topic (the least chosen topic along with geology), while 14.6% cited it as being their least-liked topic (the third most frequent response). Additionally, no group leaders mentioned human history as being involved in either their topic of study or their learning objectives for their nature center visit (Appendix 46).

4. At both nature centers a fairly large number of non-grouped user recommendations concerned the nature trails (16 of 109 at Brookside, 22 of 91 at Meadowside; Appendices 44-45). At each nature center, these recommendations basically involved suggestions to extend the trails (5 of 16 at Brookside, 7 of 22 at Meadowside) and the need for more interpretive information to be placed on the trails (7 of 16 at Brookside, 12 of 22 at Meadowside). These data from the clientele corroborate what Brown (1940) suggests when he states, "All nature trails, no matter of what type should for the period of their operation, be gradually growing, constantly improving and never completed." In this regard, perhaps special seasonal self-guided nature trail guides could be developed so that maximum interpretive information could be relayed, especially to repeat visitors (supporting discussion by Breiding 1952).

5. The author feels that live animals are an important part of any overall interpretive facility. At Meadowside during 1972 and 1973, live animals were utilized in 49.9% of the talks given to grouped clientele (Appendix 19). Presently, their use is at a very low level at each nature center. Survey data gathered demonstrate that both grouped and non-grouped clientele feel a need for presentations involving live animals. Of the 9 group leaders offering general comments, 3 noted a need for live animals while 2 expressed an appreciation for the taxidermy mounts (Appendix 46). Among non-grouped clientele, 16 of 109 recommendations received at Brookside concerned a request for live animal presentations, while 8 of 91 similar requests were obtained at Meadowside (Appendices 44-45). In response to the above, the author would recommend that lower forms of live animals (especially reptiles) be incorporated extensively into the nature center programs. Certain species of mammals

and birds would certainly create additional interest and are recommended for inclusion if at all possible.

6. Throughout the literature various authorities (e.g. Peart 1975a, Peart 1975b, Goff n.d., Shomon 1964, Gross and Railton 1972) strongly suggest that grouped clientele be exposed to the natural environment as much as possible, making it their learning environment. It is interesting to note that in this survey 8 of 17 group leaders specified that the unit of study in conjunction with their nature center visit centered around seasonally orientated topics (e.g. animal adaptations to cold weather; Appendix 46). Additionally, 8 of 23 group leaders noted that learning objectives for their groups centered around the development of observational skills and the identification of flora and fauna. The above data seem to support the concept that teachers are interested in having their students experience the out-of-doors when visiting the nature center, especially if it can be related to seasonal changes in the weather. Perhaps with the above in mind, school group programs should be modified to increase the amount of time spent out of doors. This alteration may be especially important at Brookside Nature Center where, during the four year period from 1972 through 1975, only 22.8% of the grouped clientele (of which 76.8% were school groups) participated in a nature hike (Appendices 16,18).

CONCLUSION

This paper has attempted to deal with a wide spectrum of the multi-faceted concepts inherent to nature interpretation. Primary source material has been gleaned from the literature review, from examinations of interpretive facilities in the Washington, D.C. area and throughout the country, and from a case study of two M.N.C.P.P.C. nature centers. The author hopes that the latter will constitute a base study from which future research efforts can obtain comparative data.

It seemed most appropriate, because of the inherent make-up of this paper, to place the conclusions to each section of the paper generally at the end of each respective section. Therefore, no reiteration of the material is presented at this point. However, the author does feel that one overriding concern should be presented.

Statistically based evaluations are important in gaining insight into clientele interests and needs and how they can best be met by the nature center. These evaluations can help to monitor evolutions in clientele characteristics, they can provide insight into the effects of changes in the state of the art, and they are especially important in providing base line data to substantiate or refute criticism which may arise, either from internal or external sources. Nature interpreters (especially those in administrative positions) should realize that clear, concise objectives are of critical importance to the evaluation process. They provide a basis against which to measure the success of particular programs and facilities. Often when specific objectives are pursued, financial, facility and/or personnel limitations may force a choice among various priorities. For example, should non-grouped clientele be the recipient of scheduled nature hikes throughout the weekend or should these resources be channeled into other areas (e.g. grouped clientele needs)? Perhaps an optimum interpretive facility does not constitute the provider of every need for every clientele entity. Furthermore, the question of whether clientele needs and clientele desires are synonymous should be considered. The author suspects that they are not. In this case, which should receive priority and under what conditions?

There is a place for quality interpretation (e.g. a one-to-one bird hike at 7 a.m.). There is a place for quantity exposure (e.g. to large groups being channeled through pre-arranged programs). There is even a place for "nonverbal interpretation." What is the latter? It is a subjective entity that resists definition. It is a quiet walk in the rain, it is an understanding smile, it is part of the spirit of interpretation. It is knowing when and where words are a hindrance to wise and effective interpretation.

The author's hope is that the data, the ideas and even the unanswered questions which constitute this paper will be of benefit, not just to those who read it, but from thence to the natural environment; something which wise men attempt to interpret and protect.

Appendix 1. Tilden's six principles of interpretation (quoted from Tilden 1957).

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.

2. Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information.

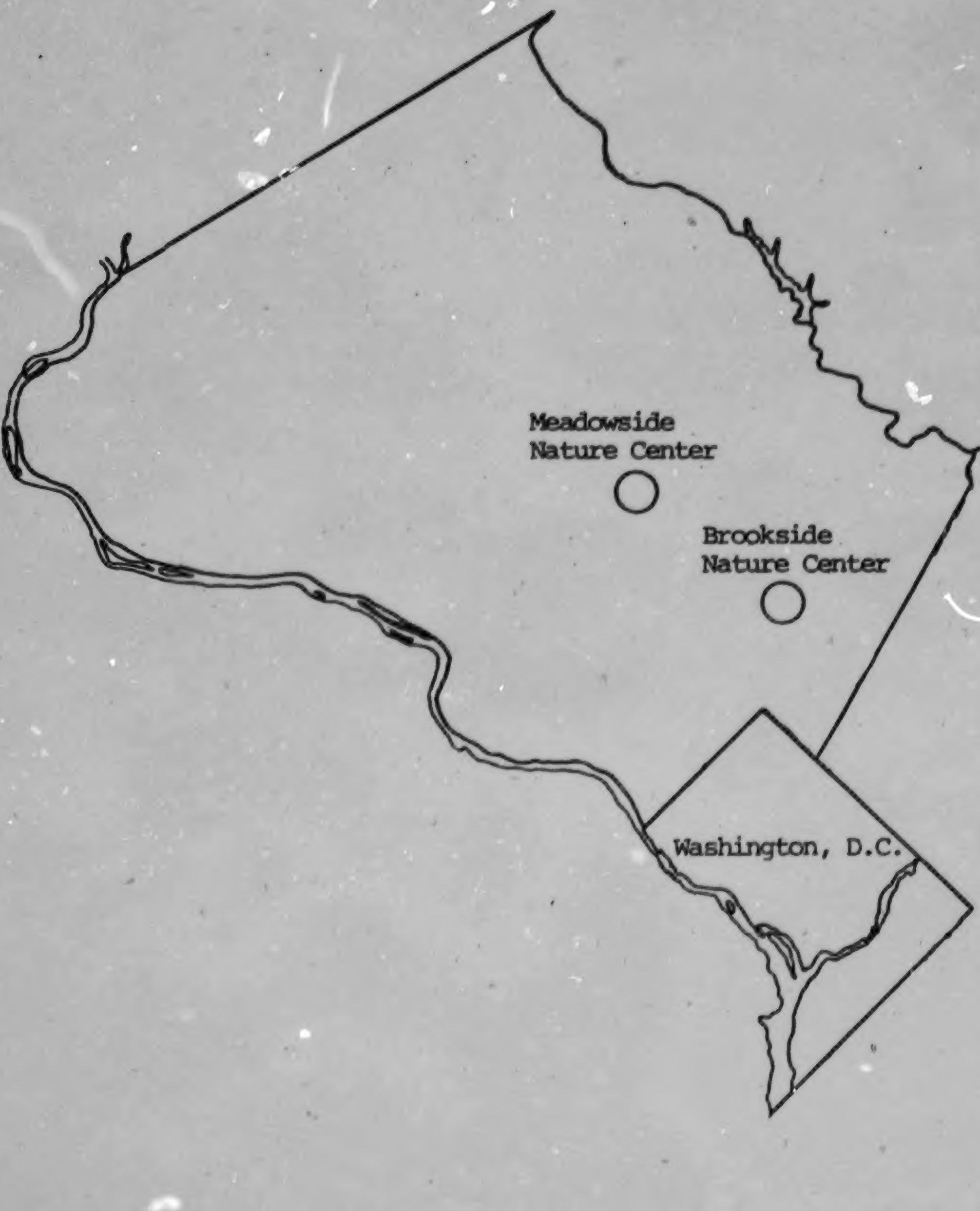
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.

4. The chief aim of Interpretation is not instruction, but provocation.

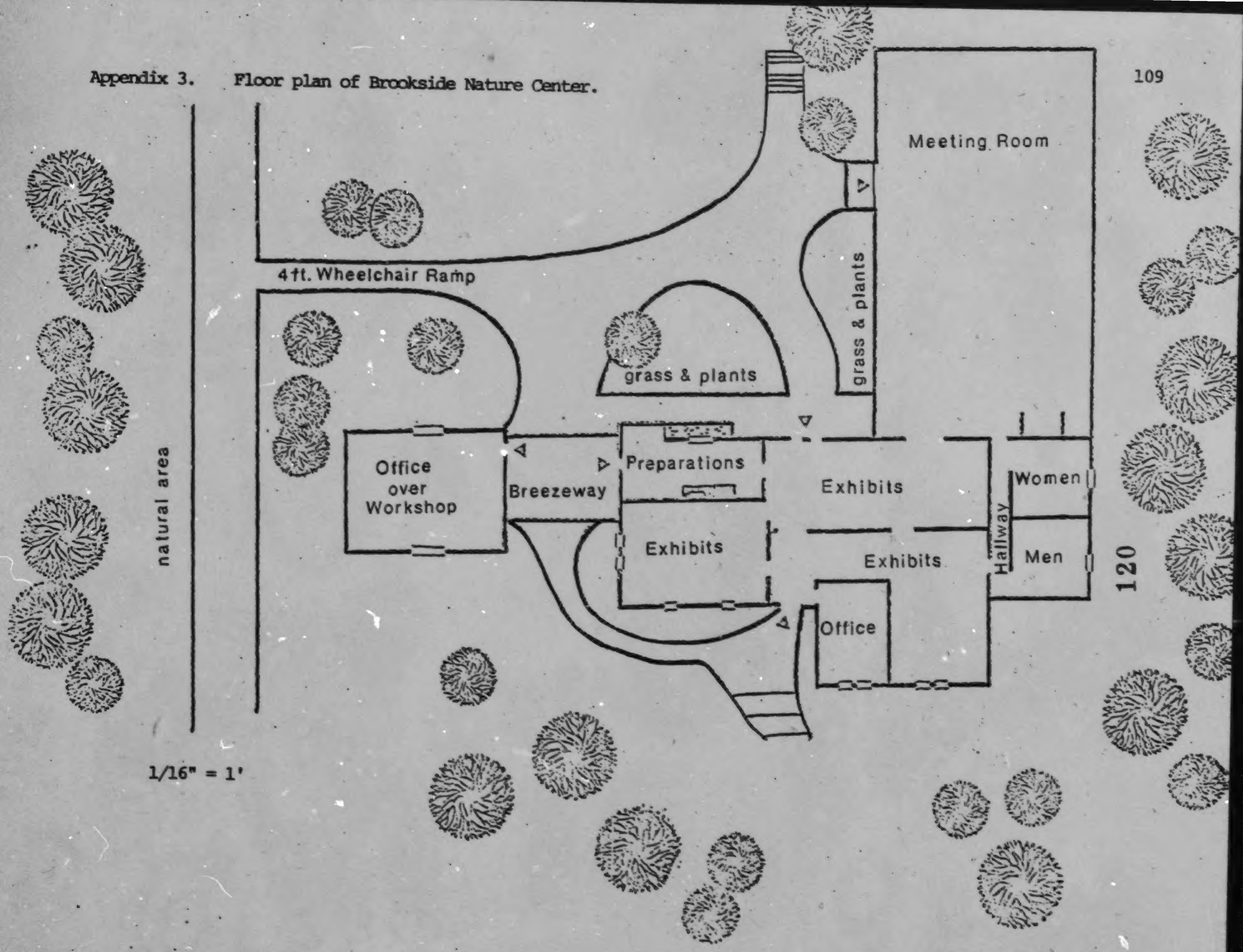
5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase.

6. Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program.

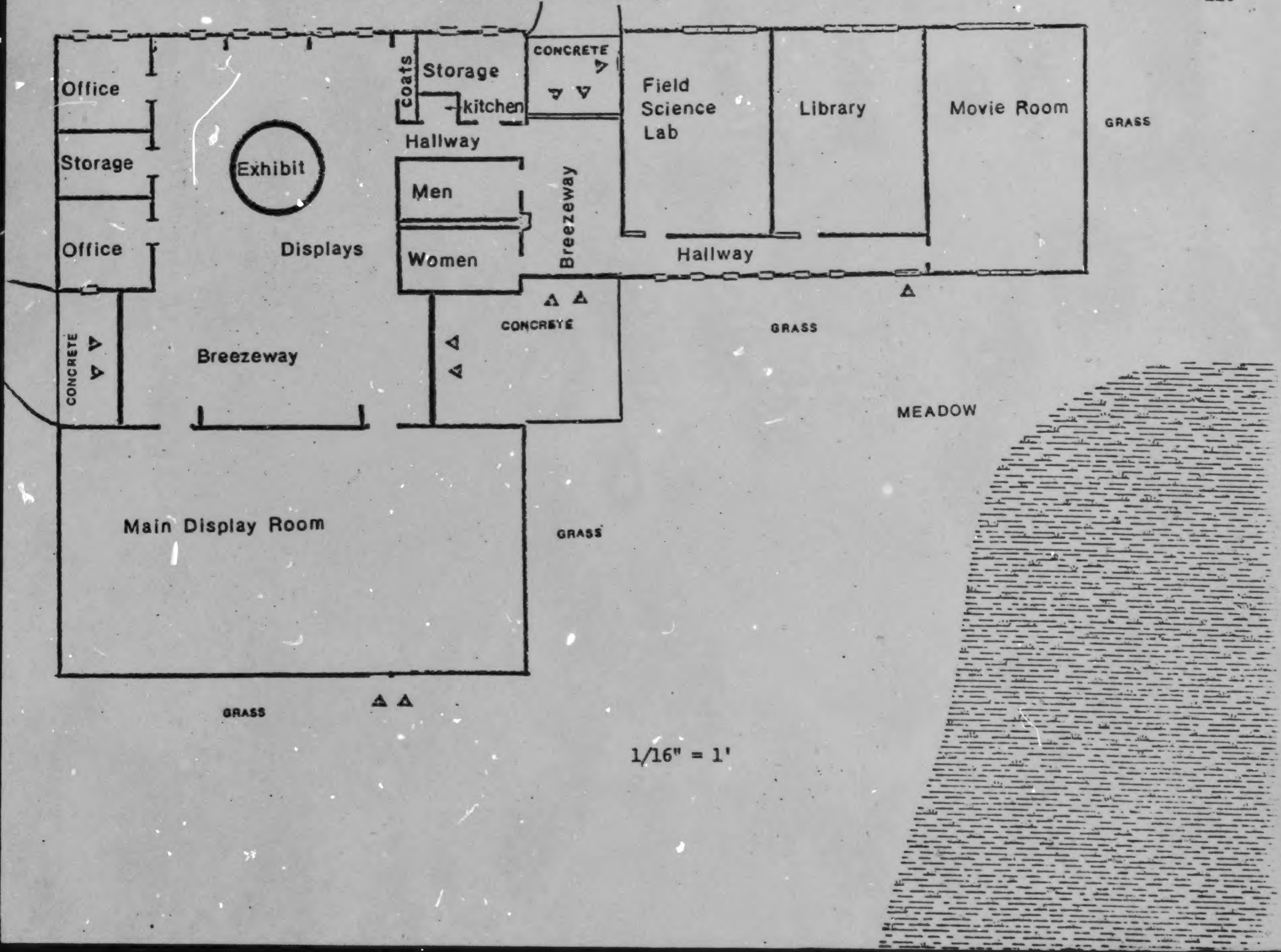
Appendix 2. Location of Brookside Nature Center and Meadowside Nature Center in Montgomery County, Maryland.


Meadowside Nature Center
Brookside Nature Center
Washington, D.C.

Appendix 3. Floor plan of Brookside Nature Center.


natural area
4ft. Wheelchair Ramp
grass & plants
grass & plants
Meeting Room
Office over Workshop
Breezeway
Preparations
Exhibits
Exhibits
Exhibits
Office
Hallway
Women
Men
1/16" = 1'

Appendix 4. Floor plan of Meadowside Nature Center.


Office
Storage
Office
Exhibit
Displays
Coats
Storage
kitchen
Hallway
Men
Women
CONCRETE
Breezeway
Field Science Lab
Library
Movie Room
GRASS
Hallway
CONCRETE
Breezeway
CONCRETE
GRASS
MEADOW
Main Display Room
GRASS
GRASS
1/16" = 1'

Appendix 5. Objectives of Brookside Nature Center (quoted from Ernst 1961).

Believing that all worthwhile programs are based on sincerity and dedication to purpose, the Brookside Nature Center seeks to serve the public in a very special field of endeavor -- that of making our citizens deeply conscious of the natural environment at a time in our history when the emphasis is on a spiraling technology and a suffocating artificiality! We do not propose to lock ourselves in combat in opposition to the miracles of machines, nor to challenge the progress which has sprinkled prosperity all across the land. We cannot quarrel with higher standards of living, or increased time for leisure, or bountiful harvests, or better housing -- and all of these things have come about as a result of man's technological achievement ...

Rather, we like to think, ours is a positive approach to a job we think needs doing in these times -- reminding our people of their need for the out-of-doors, in terms of refreshment of mind and spirit, and their responsibilities in caring for it in perpetuity. Sometimes, in this age, the daily harrassments of a geared-up society demand relief; more and more our people are looking to the forest, the meadow, stream and lake for a purging of concrete and asphalt and glass and steel. Our job at the Brookside Nature Center is to provide a bonus in terms of interpreting some of the basic marvels of nature -- some as intricate as the most complex computer, others so widespread and common that we can only wonder why they have gone so long unseen ...

Annually now, millions are going into the out-of-doors -- for a time to throw off the shackles of "the rest-of-the-year grind" -- tasks made all the more formidable by unceasing competition and preset time tables. Our job is to insure outdoor recreation in quantity and quality, so that our patrons can reassemble their sense of values in an atmosphere of totally different sights, sounds, and activities ...

Our job is to weave this experience within a framework of trees and meadows and streams -- to offer places of solitude for those who need peace and quiet -- and other places for healthful and vigorous activities for those who would improve both body and mind. Our job is to educate, so that these places will endure as they are -- so that they will never take on the artificial characteristics of places we leave behind when we seek the out-of-doors in the first place!

All across the land, there is a sense of urgency these days. We hear much of "open spaces" and "conservation" and the immediate need for placing parcels of the natural environment in the public trust. Some of us, not yet pressed for a place "to get away from it all", are not yet concerned. Others, consider all lands reserved for public use as a terrible waste -- no longer subject to private enterprise and a dead loss to the tax rolls. Our people will make the final judgment ...

Appendix 5. Continued

Ours is the task to present the story of the natural environment in the face of an engulfing megalopolis — the need for nature and how best to conserve it.

Our creed — "to apprise our people of the need for balance in nature and nature-destructive technology, so that each will continue to flourish."

Appendix 6. Objectives of Meadowside Nature Center (quoted from Nopper 1976).

The purpose of Meadowside is to develop an interpretive program at the center that will provide the learning tools necessary for intelligent insight into the natural world through educational as well as enjoyable outdoor and indoor experiences. Secondly, the purpose will be to instill in all visitors a recognition of the educational opportunities available in their natural surroundings, and to provide experiences and/or training at the center by giving teachers and students the understanding and competence needed so that they can use the natural environment of the community as an educational resource. We are dedicated to the enrichment of human and natural resources. To accomplish the goals as recognized in the purpose for Meadowside's being, a staff of three park naturalists working at the center will be responsible for administering park programs and providing leadership in achieving the following objectives. Meadowside is ...

1. To be a "Model Conservation Area" -- showing or exhibiting conservation practices and methods.

2. To be "A Working Center" (outdoor-indoor) -- involving many individuals and groups in active projects, demonstrations, forums, and other interests (preschool, elementary school, middle school, high school, college, university, scouts, clubs, and families).

3. On a scheduled basis: to have displayed the results of projects, studies and donations -- giving credits and recognition.

4. To provide basic nature center activities on site (indoor-outdoor) -- guided walks, talks, slide and movie shows, studies, demonstrations, and programs for handicapped (on a scheduled basis).

5. To provide special programs such as organizing environmental forums -- mediating debate and/or discussion -- assimilate facts at conducted forums and acting as an information source providing direction as to where answers concerning environmental questions may be obtained. Also providing leadership to a conducted tour of a site within U.R.C.R.P. -- such as the sediment treatment station or historical mill site (tours away from immediate nature center area).

6. To be a storehouse of environmental information. Within the park various studies will be undertaken with respect to tree measurements, wildlife sightings, water quality testing, etc. Each study will be on file at the nature center library.

7. To provide limited equipment -- lab materials, and lab facility for experimental studies and research, as well as fun filled activities.

8. To develop a close program relationship to the proposed outdoor education center (utilizing the park's study areas and offerings on a controlled and defined basis).

Appendix 6. Continued

9. To encourage questions related to the natural environment, park operations, park programs, and to maintain a phone answering service so that a trained naturalist may answer questions and assist in scheduling programs.

10. To provide printed leaflets, handouts, maps, brochures, newsletters, and other reading materials offering directional and educational information (provide guidance as to the sources where answers to questions may be obtained).

Please note: The next six appendices are as follows.

Appendix 7.	"Review of Reactions" survey.
Appendix 8.	Brookside non-grouped user survey.
Appendix 9.	Meadowside non-grouped user survey.
Appendix 10.	Grouped user survey.
Appendix 11.	Staff survey.
Appendix 12.	Potential user survey.

REVIEW of REACTIONS

This questionnaire is designed so that you may help the staff of the Division of Interpretation & Conservation serve you better through our Nature Center's Program. Drop your comments in our suggestion box or mail them to our center.

1. I first visited this center in ______________________.

2. Will you return? YES____ NO____.

3. I came to the Nature Center primarily:
   - ____ To walk the nature trail.
   - ____ To attend a program.
   - ____ To consult a naturalist.
   - ____ To browse.
   - ____ By chance.
   - ____ With a group.

4. I liked the ____________________________ exhibit best.

5. I liked the ____________________________ exhibit least.

6. I would like to see the following additions: ____________
   ____
   ____
   ____

7. I visited your center______times in______year(s).

****

MEADOWSIDE NATURE CENTER
5100 Meadowside Lane
Rockville, Maryland 20853

BROOKSIDE NATURE CENTER SURVEY

No. ________

1. Age: ☐ 8-12 ☐ 13-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 or over

2. Sex: ☐ male ☐ female

3. Completed education: ☐ 8th grade ☐ high school ☐ college ☐ grad school

4. Occupation: ☐ professional ☐ technical ☐ student ☐ housewife
   ☐ other (specify) ____________________

5. Who did you come to the nature center with?
   ☐ family ☐ friend ☐ class ☐ alone

6. If you came with any of your children, what are their ages? ____________

7. How far do you live from the nature center?
   ☐ less than 1 mile ☐ 1-2 miles ☐ 3-5 miles
   ☐ over 5 miles (but in Md.) ☐ out of state

8. How many times have you visited this nature center within the last twelve months?
   ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

9. Check each nature center you have visited.
   - ☐ Meadowside Nature Center (Rockville, Md.)
   - ☐ Clearwater Nature Center (Clinton, Md.)
   - ☐ Watkins Nature Center (Largo, Md.)
   - ☐ Catoctin Mt. Park Nature Center (Thurmont, Md.)
   - ☐ Rock Creek Park Nature Center (Washington, D.C.)

10. What was the MAIN reason(s) that you came to the Brookside Nature Center?
    - ☐ to watch a film
    - ☐ to look at the exhibits
    - ☐ to go on a guided trail walk or building exhibit tour with a naturalist
    - ☐ to go on the self-guided nature trail
    - ☐ just to visit a nature center facility
    - ☐ to get information for a school project or other project
    - ☐ to participate in some other nature center program (specify) __________
    - ☐ other (specify) ____________________

11. In regards to your aspirations for this nature center visit, what level of satisfaction did you experience?
    ☐ very satisfied ☐ satisfied ☐ mildly dissatisfied ☐ very dissatisfied

12. Check each program that you have participated in at the Brookside Nature Center.

- ☐ Junior Naturalist Program
- ☐ Conservation Club
- ☐ Brookside Nature Photography Contest
- ☐ Charlie Ecology Program

13. Check each activity that you have done at the Brookside Nature Center.

- ☐ watched a film
- ☐ looked at the exhibits
- ☐ gone on the self-guided nature trail
- ☐ been led by a naturalist on a trail walk
- ☐ been led by a naturalist on a building exhibit tour

14. Which one of the following nature center activities do you find to be the MOST stimulating and enjoyable?

- ☐ films
- ☐ self-guided nature trail
- ☐ displays and exhibits
- ☐ guided building exhibit tour with a naturalist
- ☐ guided trail walk with a naturalist
- ☐ other (specify) ______________________

15. Which one of the following nature center activities do you find to be the LEAST stimulating and enjoyable?

- ☐ films
- ☐ self-guided nature trail
- ☐ displays and exhibits
- ☐ guided building exhibit tour with a naturalist
- ☐ guided trail walk with a naturalist
- ☐ other (specify) ______________________

16. If you have gone on the self-guided nature trail during this trip, how would you rate it?

☐ very good ☐ good ☐ fair ☐ poor

17. Please rate the staff members as far as their friendliness and helpfulness to you.

☐ very good ☐ good ☐ fair ☐ poor

18. What do you think would be the MOST beneficial improvement in each of the following?

Exhibits ____

Nature Trails ____

Talks by the Naturalist _________________________________

Films ____

19. General comments or suggestions about the nature center ______________________

____

PLEASE DEPOSIT SURVEYS IN THE BOX PROVIDED. THANK YOU VERY MUCH!

MEADOWSIDE NATURE CENTER SURVEY

No. ______

1. Age: ☐ 8-12 ☐ 13-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 or over

2. Sex: ☐ male ☐ female

3. Completed education: ☐ 8th grade ☐ high school ☐ college ☐ grad school

4. Occupation: ☐ professional ☐ technical ☐ student ☐ housewife
☐ other (specify) ______________________________

5. Who did you come to the nature center with?
☐ family ☐ friend ☐ class ☐ alone

6. If you came with any of your children, what are their ages? ______________

7. How far do you live from the nature center?
☐ less than 1 mile ☐ 1-2 miles ☐ 3-5 miles
☐ over 5 miles (but in Md.) ☐ out of state

8. How many times have you visited this nature center within the last twelve months?
☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 or more

9. Check each nature center you have visited.
☐ Brookside Nature Center (Wheaton, Md.)
☐ Clearwater Nature Center (Clinton, Md.)
☐ Watkins Nature Center (Largo, Md.)
☐ Catoctin Mt. Park Nature Center (Thurmont, Md.)
☐ Rock Creek Park Nature Center (Washington, D.C.)

0. What was the MAIN reason(s) that you came to the Meadowside Nature Center?
☐ to watch a film
☐ to look at the exhibits
☐ to go on a guided trail walk or building exhibit tour with a naturalist
☐ to go on the self-guided nature trail
☐ just to visit a nature center facility
☐ to get information for a school project or other project
☐ to participate in some other nature center program (specify) __________
☐ to use the library
☐ other (specify) ______________________________

1. In regards to your aspirations for this nature center visit, what level of satisfaction did you experience?
☐ very satisfied ☐ satisfied ☐ mildly dissatisfied ☐ very dissatisfied

12. Check each program that you have participated in at the Meadowside Nature Center.

- ☐ Junior Naturalist Program
- ☐ Conservation Club
- ☐ Charlie Ecology Program
- ☐ Arts and Crafts Workshops
- ☐ Explorers' Post

13. Check each activity that you have done at the Meadowside Nature Center.

- ☐ watched a film
- ☐ looked at the exhibits
- ☐ used the library
- ☐ gone on the self-guided nature trail
- ☐ been led by a naturalist on a trail walk
- ☐ been led by a naturalist on a building exhibit tour

14. Which one of the following nature center activities do you find to be the MOST stimulating and enjoyable?

- ☐ films
- ☐ self-guided nature trail
- ☐ displays and exhibits
- ☐ library
- ☐ guided building exhibit tour with a naturalist
- ☐ guided trail walk with a naturalist
- ☐ other (specify) ____________

15. Which one of the following nature center activities do you find to be the LEAST stimulating and enjoyable?

- ☐ films
- ☐ self-guided nature trail
- ☐ displays and exhibits
- ☐ library
- ☐ guided building exhibit tour with a naturalist
- ☐ guided trail walk with a naturalist
- ☐ other (specify) ____________

16. If you have gone on the self-guided nature trail during this trip, how would you rate it?

☐ very good ☐ good ☐ fair ☐ poor

17. Please rate the staff members as far as their friendliness and helpfulness to you.

☐ very good ☐ good ☐ fair ☐ poor

18. What do you think would be the MOST beneficial improvement in each of the following?

Exhibits ____________

Nature Trails ____________

Talks by the Naturalist ____________

Films ____________

Library ____________

19. General comments or suggestions about the nature center ____________

____

PLEASE DEPOSIT SURVEYS IN THE BOX PROVIDED. THANK YOU VERY MUCH!

TO: School Teachers and Group Leaders

FROM: Loren W. Lustig, Biologist II, University of Maryland

SUBJECT: Would you please fill out this survey and either drop it off at the nature center's central office or return it by mail to the nature center. This survey is part of a joint research effort by the Maryland National Capital Park and Planning Commission and the University of Maryland. Your responses are very important and greatly appreciated.

1. Please check which nature center you are visiting.
   ☐ Brookside Nature Center ☐ Meadowside Nature Center

2. Age level of group ____________________ 3. Grade level of group ________________

4. Class or type of group ____

5. Sponsoring organization: ☐ school system ☐ "scouting" organization
   ☐ other organization (specify) ________________________________

6. Number of students in group ___________

7. Approximate distance of school (base location) from nature center ________________

8. How often does your group come to the nature center? ______________________________

9. Is this visit in conjunction with a particular unit of study?
   ☐ yes ☐ no

   a. If so, what topic? ____

10. Was a preparatory lecture or pre-test presented to your group before the visit?
    ☐ yes ☐ no

11. Will there be a test or other written means of evaluating the students following your visit?
    ☐ yes ☐ no

    a. If so, please specify ____

12. Check each of the following activities which your group participated in during this visit.
    ☐ watched a film
    ☐ looked at the exhibits
    ☐ went on the self-guided nature trail
    ☐ led by a naturalist on a building exhibit tour
    ☐ other (specify) ____
    ☐ led by a naturalist on a trail walk
    ☐ hiked on other nature trails
    ☐ used the library (Meadowside only)

13. Which one of the following nature center activities do you feel is the MOST stimulating and enjoyable for your group?

☐ films
☐ self-guided nature trail
☐ displays and exhibits
☐ library (Meadowside only)
☐ guided building exhibit tour with a naturalist
☐ guided trail walk with a naturalist
☐ other (specify) ____________________

14. Which one of the following nature center activities do you feel is the LEAST stimulating and enjoyable for your group?

☐ films
☐ self-guided nature trail
☐ displays and exhibits
☐ library (Meadowside only)
☐ guided building exhibit tour with a naturalist
☐ guided trail walk with a naturalist
☐ other (specify) ____________________

15. If applicable, please rate the conducted building exhibit tour (or guided trail walk) as to its benefit to your group.

☐ very good ☐ good ☐ fair ☐ poor

a. How well was the naturalist prepared?

☐ very well ☐ well ☐ fair ☐ poorly prepared

16. What learning objectives did you have for your group on this visit?

____
____
____

17. How well do you feel that these objectives were fulfilled?

☐ very well ☐ well ☐ fair ☐ poorly

18. If certain objectives were not accomplished, what specific improvements could be made at the nature center to facilitate their accomplishment?

____
____
____

19. Comments or suggestions about the nature center ____________________

____
____
____

Thank you very much for your help with this survey! Please return this form in the envelope provided to the nature center you visited. The addresses are:

Senior Park Naturalist
Brookside Nature Center
1400 Glenallan Avenue
Wheaton, Maryland 20902

Senior Park Naturalist
Meadowside Nature Center
5100 Meadowside Lane
Rockville, Maryland 20853

TO: The Montgomery County Naturalist Staff, M.N.C.P.P.C.

FROM: Loren W. Lustig, Biologist II, University of Maryland

SUBJECT: Would you please fill out this survey and return it to me using the attached envelope. Your assistance in this joint research effort (M.N.C.P.P.C. and University of Maryland) is very important and greatly appreciated.

1. Which nature center are you associated with?
   - ☐ Brookside Nature Center
   - ☐ Meadowside Nature Center

2. How many years of working experience have you had in nature interpretation?

   _________ years

3. Completed education:
   - ☐ 1 year college
   - ☐ 2 years college
   - ☐ 3 years college
   - ☐ bachelors degree
   - ☐ advanced degree

4. To your knowledge, what is the MAJOR reason people come to the nature center?
   - ☐ to watch a film
   - ☐ to look at the exhibits
   - ☐ to go on a guided trail walk or building exhibit tour with a naturalist
   - ☐ to go on the self-guided nature trail
   - ☐ just to visit a nature center facility
   - ☐ to get information for a school project or other project
   - ☐ to participate in some other nature center program (specify) __________
   - ☐ to use the library (Meadowside only)
   - ☐ other (specify) ______________________________

5. Which one of the following nature center activities do you think is the MOST stimulating and enjoyable to the majority of visitors?
   - ☐ films
   - ☐ self-guided nature trail
   - ☐ guided trail walk with a naturalist
   - ☐ guided building exhibit tour with a naturalist
   - ☐ displays and exhibits
   - ☐ library (Meadowside only)
   - ☐ other (specify) ______________________________

6. Which one of the following nature center activities do you think is the LEAST stimulating and enjoyable to the majority of visitors?
   - ☐ films
   - ☐ self-guided nature trail
   - ☐ guided trail walk with a naturalist
   - ☐ guided building exhibit tour with a naturalist
   - ☐ displays and exhibits
   - ☐ library (Meadowside only)
   - ☐ other (specify) ______________________________

7. What do you see as the most critical overall need for improving the nature center?

____

____

____

8. Specifically, how could each of the following be improved at the nature center?

Films ____________________________________

____

Self-guided nature trail ______________________

____

Guided trail walks and tours with a naturalist __________

____

Displays and exhibits _________________________

____

Library (Meadowside only) _____________________

____

9. Please identify any segment of the population which you feel is now unreached by the nature center but which could be served if the activities, hours or other parameters of the nature center were altered.

Unreached segment of population ________________

Needed changes for the nature center to reach the above __________

____

10. Please note what you feel is the major contribution from the nature center to the community.

____

____

____

THANK YOU VERY MUCH FOR YOUR HELP WITH THIS SURVEY!

Hello. I am conducting a survey for the University of Maryland and the Montgomery County Park and Planning Commission. Would you take just a few minutes to answer the following questions?

1. Have you ever heard of either of the following Montgomery County nature centers?

Brookside Nature Center	☐ yes	☐ no
Measowside Nature Center	☐ yes	☐ no

IF NO, SKIP TO #5; DELETE #8a

2. How did you learn about the nature center(s)?
   - ☐ through a visit to the nature center
   - ☐ through friends, neighbors, relatives or family
   - ☐ through radio, T.V., newspapers or pamphlets
   - ☐ other (specify) ______________________________

3. Which of the following nature center programs and activities are you aware of, or familiar with?
   - ☐ films
   - ☐ self-guided nature trail
   - ☐ naturalist led trail walks and building exhibit tours
   - ☐ displays and exhibits
   - ☐ Conservation Club
   - ☐ Junior Naturalist Program
   - ☐ Charlie Ecology Program
   - ☐ Explorers' Post
   - ☐ Brookside Nature Photography Contest
   - ☐ library
   - ☐ arts and crafts workshops

4. Have you ever visited either of these nature centers? IF YES, ASK: Within the last 12 months?

Brookside Nature Center	☐ yes	☐ no	☐ yes	☐ no
Meadowside Nature Center	☐ yes	☐ no	☐ yes	☐ no

IF NO, ASK:

a. What is the MAIN reason you have never visited either nature center?
   - ☐ I had no time available
   - ☐ their hours are inconvenient for me
   - ☐ I had no interest or need to visit
   - ☐ they are located too far away
   - ☐ other (specify) ______________________________

5. Please tell me whether you AGREE or DISAGREE with each of the following statements.

a. Nature centers are mainly for children.

☐ agree ☐ disagree ☐ don't know

b. Nature centers are only for people who are interested in studying plants and animals.

☐ agree ☐ disagree ☐ don't know

c. Nature centers are really places for people who have a lot of free time; not for people who work.

☐ agree ☐ disagree ☐ don't know

d. The major purpose of nature centers is to help people learn to enjoy and appreciate the natural environment.

☐ agree ☐ disagree ☐ don't know

6. Which one of the following are you MOST interested in?

☐ plants
☐ animals
☐ geology
☐ general ecology
☐ environmental problems
☐ climatic and weather conditions
☐ pioneer life
☐ none

7. Which one of the following are you LEAST interested in?

☐ plants
☐ animals
☐ geology
☐ general ecology
☐ environmental problems
☐ climatic and weather conditions
☐ pioneer life
☐ none

8. If you have any children living at home, what are their ages? ____________

a. To your knowledge have any of these children ever visited either Montgomery County nature center?

☐ yes ☐ no

IF YES, ASK: For what reason? ______________________________

In conclusion, we would like to ask 5 questions of a personal nature.

9. What is your age?

☐ 8-12 ☐ 13-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60 or ov

10. What is your sex? ☐ male ☐ female

11. What was the last grade you completed in school?

☐ 8th grade ☐ high school ☐ college ☐ graduate school

12. What is your occupation? ☐ professional ☐ technical ☐ student ☐ hous

☐ other (specify) ______________________________

13. What major intersection do you live near? ____________________

Address ______________________________

Phone Number ______________________________

Interviewers Comments ______________________________

____

Appendix 13. Times of maximum-minimum use, non-grouped clientele, Brookside Nature Center (control week).

	Day of week						
Time of day	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
9:00-10:00	0	0	0	0	0	-	0
10:00-11:00	0	0	0	0	0	-	0
11:00-12:00	0	0	0	1	10	-	11
12:00-1:00	0	1	2	0	29	-	32
1:00-2:00	10	3	4	2	16	54	89
2:00-3:00	2	3	3	5	74	41	128
3:00-4:00	0	1	2	7	41	85	136
4:00-5:00	4	0	1	0	11	30	46
Total	16	8	12	15	181	210	442

Appendix 14. Times of maximum-minimum use, non-grouped clientele, Meadowside Nature Center (control week).

	Day of week						
Time of day	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
9:00-10:00	0	0	0	0	2	-	2
10:00-11:00	0	2	2	0	7	-	11
11:00-12:00	0	0	0	3	0	-	3
12:00-1:00	1	2	0	5	7	-	15
1:00-2:00	3	18	0	0	14	50	85
2:00-3:00	0	1	2	2	38	36	79
3:00-4:00	0	17	3	0	35	50	105
4:00-5:00	1	0	18	0	10	23	52
Total	5	40	25	10	113	159	352

Appendix 15. Approximate age levels of non-grouped clientele at the two nature centers (control week).

Age level	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
Preschool	62	16.7	33	9.7
Primary	19	5.1	23	6.8
Intermediate	25	6.7	39	11.5
Junior high	20	5.4	20	5.9
Teenage	67	18.0	61	17.9
20's and 30's	101	27.2	78	22.9
40's and 50's	45	12.1	66	19.4
60's or over	33	8.9	20	5.9
Missing	70	-	12	-

Appendix 16. Types of groups at Brookside Nature Center.*

Year	Preschool	Primary (K-3)	Intermed. (4-6)	Jr. high (7-9)	High sch.	Special educat.	Scouts	Adults	Other	Total
1972	36 (15.5%)	79 (33.9%)	65 (27.9%)	2 (.9%)	1 (.4%)	8 (3.4%)	39 (16.7%)	3 (1.3%)	0	233
1973	43 (19.0%)	93 (41.2%)	41 (18.1%)	0	2 (.9%)	1 (.4%)	41 (18.1%)	2 (.9%)	3 (1.3%)	226
1974	45 (26.5%)	41 (24.1%)	23 (13.5%)	3 (1.8%)	2 (1.2%)	2 (1.2%)	45 (26.5%)	9 (5.3%)	0	170
1975	71 (40.1%)	40 (22.6%)	19 (10.7%)	0	0	2 (1.1%)	44 (24.9%)	0	1 (.6%)	177
Total	191 (23.7%)	253 (31.4%)	148 (18.4%)	5 (.6%)	5 (.6%)	13 (1.6%)	169 (21.0%)	14 (1.7%)	4 (.5%)	806

* the row percentage is cited below the absolute frequency

Appendix 17. Types of groups at Meadowside Nature Center.*

Year	Preschool	Primary (K-3)	Intermed. (4-6)	Jr. high (7-9)	High sch.	Special educat.	Scouts	Adults	Other	Total
1972	27 (11.0%)	41 (16.7%)	46 (18.7%)	3 (1.2%)	4 (1.6%)	4 (1.6%)	100 (40.7%)	21 (8.5%)	0	246
1973	32 (14.7%)	52 (23.9%)	36 (16.5%)	5 (2.3%)	7 (3.2%)	8 (3.7%)	64 (29.4%)	14 (6.4%)	0	218
1974	33 (26.2%)	11 (8.7%)	12 (9.5%)	1 (.8%)	2 (1.6%)	0	47 (37.3%)	19 (15.1%)	0	126
1975	38 (25.2%)	9 (6.0%)	13 (8.6%)	3 (2.0%)	3 (2.0%)	1 (.7%)	56 (37.1%)	28 (18.5%)	0	151
Total	130 (17.5%)	113 (15.3%)	107 (14.4%)	12 (1.6%)	16 (2.2%)	13 (1.8%)	267 (36.0%)	86 (11.6%)	0	741

* the row percentage is cited below the absolute frequency

Appendix 18. Number of groups participating in each activity at Brookside Nature Center.*

Year	Nature hike	Film	Talk	Tour	Project	Weather	Demon/ worksh.	Total # of activities performed	Total # of groups participating in a specific program
1972	72 (31.6%)	109 (47.8%)	74 (32.5%)	41 (18.0%)	0	39 (17.1%)	0	335	228
1973	42 (19.5%)	117 (54.4%)	84 (39.1%)	65 (30.2%)	0	30 (14.0%)	0	338	215
1974	26 (15.8%)	89 (53.9%)	68 (41.2%)	51 (30.9%)	0	9 (5.5%)	1 (.6%)	244	165
1975	37 (21.8%)	101 (59.9%)	59 (34.7%)	61 (35.9%)	2 (1.2%)	12 (7.1%)	0	272	170
Total	177 (22.8%)	416 (53.5%)	285 (36.6%)	218 (28.0%)	2 (.3%)	90 (11.6%)	1 (.1%)	1189	778

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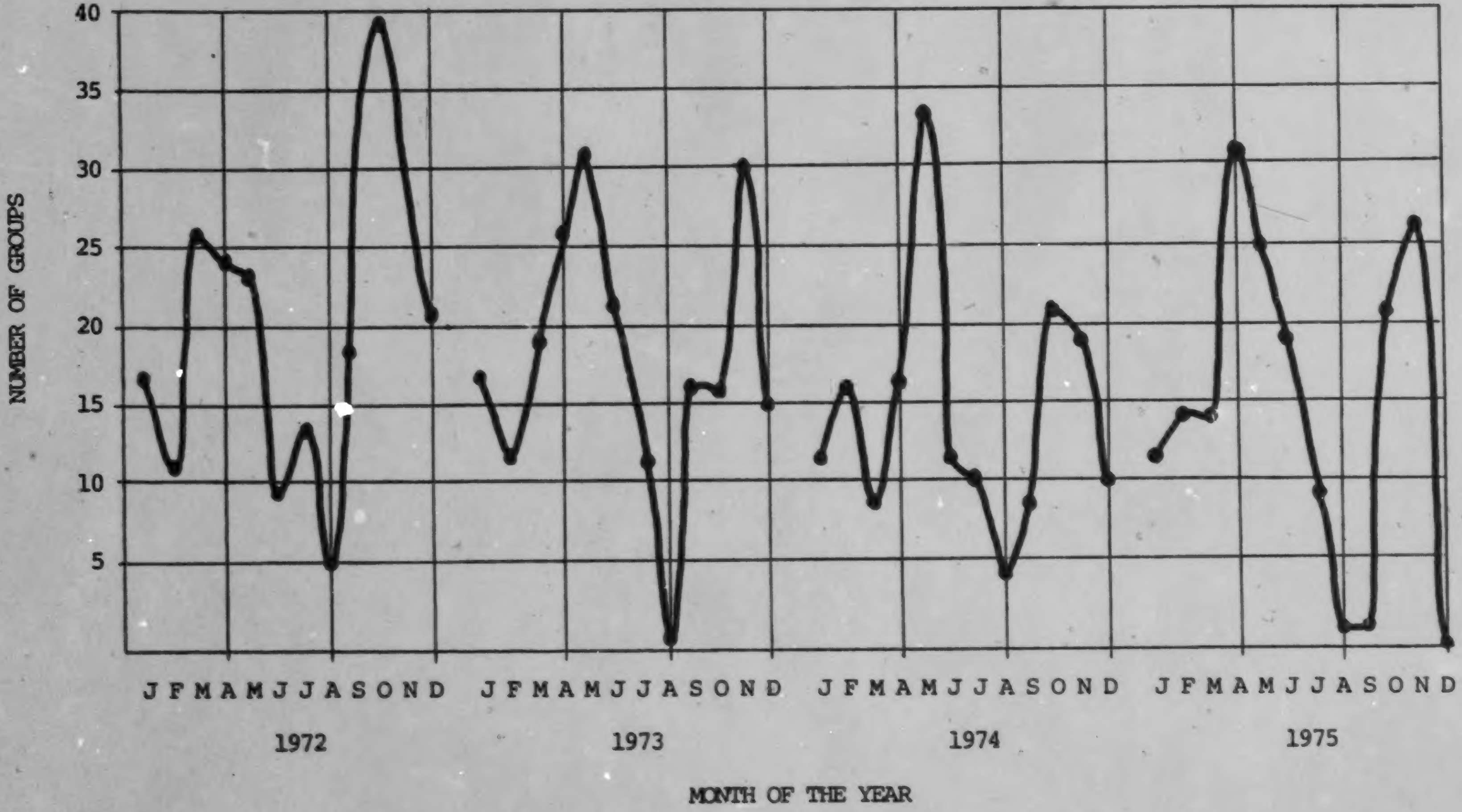
* percentages were obtained by dividing the number of groups participating in each activity by the total number of groups participating in a specific program

Appendix 19. Number of groups participating in each activity at Meadowside Nature Center.*

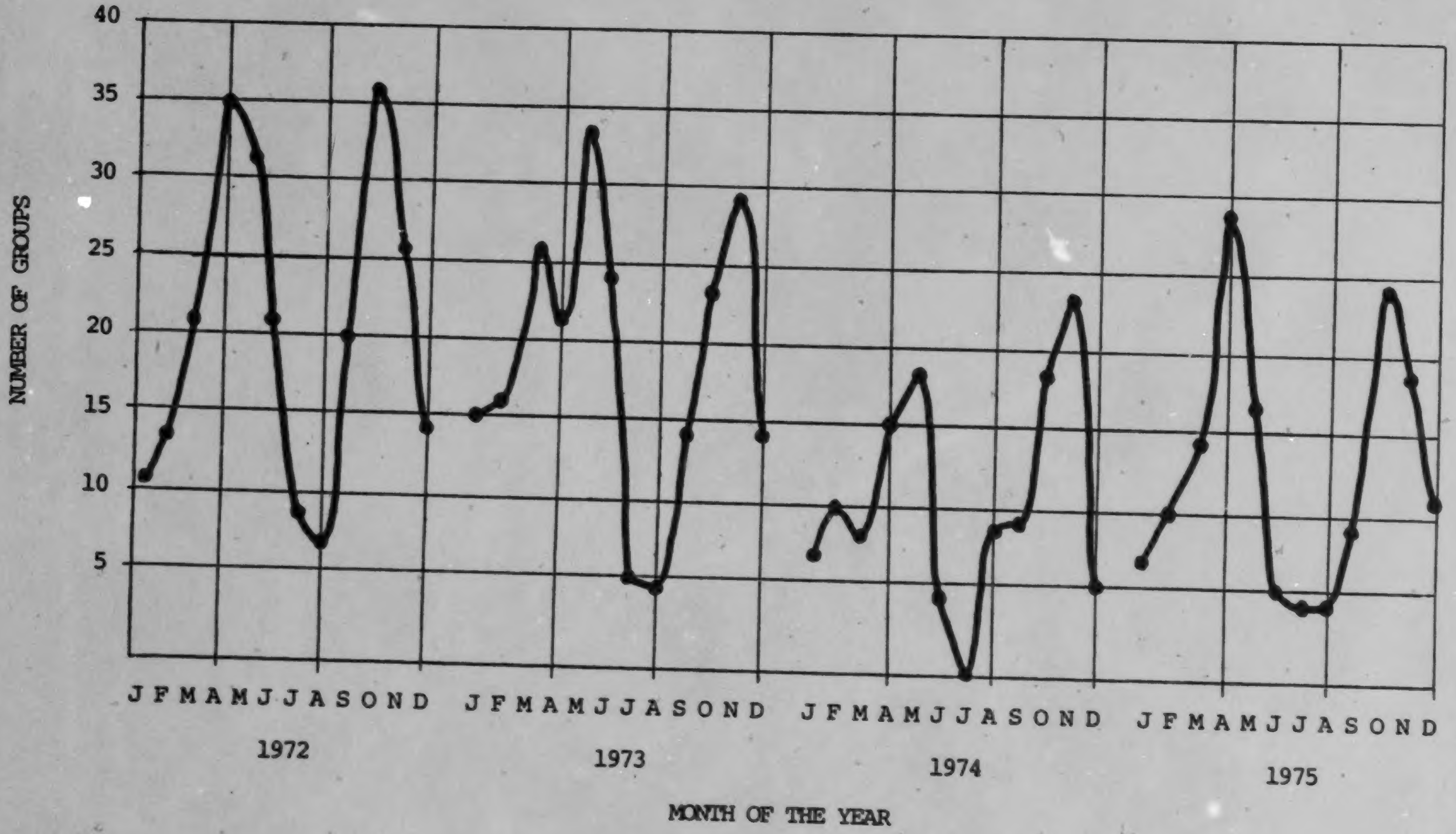
Year	Nature hike	Film	Talk	Tour	Project	Weather	Demon/ worksh.	Animals	Slides	Total # of activ. perf.	Total # of groups participating in a specific program
1972	141 (62.7%)	109 (48.4%)	64 (28.4%)	34 (15.1%)	29 (12.9%)	4 (1.8%)	0	102 (45.3%)	0	483	225
1973	142 (72.5%)	142 (72.5%)	42 (21.4%)	19 (9.7%)	11 (5.6%)	4 (2.0%)	0	108 (55.1%)	0	468	196
1974	90 (78.3%)	54 (47.0%)	19 (16.5%)	6 (5.2%)	7 (6.1%)	3 (2.6%)	1 (.9%)	35 (30.4%)	17 (14.8%)	232	115
1975	92 (63.9%)	52 (36.1%)	35 (24.3%)	11 (7.6%)	12 (8.3%)	0	10 (6.9%)	22 (15.3%)	42 (29.2%)	276	144
Total	465 (68.4%)	357 (52.5%)	160 (23.5%)	70 (10.3%)	59 (8.7%)	11 (1.6%)	11 (1.6%)	267 (39.3%)	59 (8.7%)	1459	680

* percentages were obtained by dividing the number of groups participating in each activity by the total number of groups participating in a specific program

Appendix 20. Number of groups visiting Brookside Nature Center (for a specific program) each month.



Appendix 21. Number of groups visiting Meadowside Nature Center (for a specific program) each month.



Appendix 22. Comparison of control and test groups including surveys from 8-12 year olds (non-grouped user survey).*

Questionnaire number	Questionnaire item	Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Characteristics							
1	Age	14.21	6	.0274	17.07	6	.0090
2	Sex	2.27	1	.1316	3.54	1	.0598
3	Completed education	1.58	3	.6650	3.10	3	.3771
4	Occupation	11.76	4	.0192	8.01	4	.0911
Parameters of Nature Center Visit							
5	Came with	3.43	4	.4883	4.39	4	.3556
7	Distance	3.63	4	.4589	1.85	4	.7630
8	Number of visits (within last 12 months)	4.23	5	.5161	5.89	5	.3174
10a	Reason(film)	7.97	1	.0048	2.17	1	.1412
10b	Reason(exhibits)	.33	1	.5681	3.60	1	.0577
10c	Reason(guided walk/tour)	.05	1	.8263	.03	1	.8556
10d	Reason(self-guided nature trail)	1.71	1	.1911	.02	1	.8931
10e	Reason(visit nature center)	4.35	1	.0369	3.50	1	.0615
10f	Reason(project)	.19	1	.6632	1.13	1	.2886
10g	Reason(nature ctr. program)	NV	NV	NV	.14	1	.7114
10h	Reason(library)	NA	NA	NA	1.13	1	.2886
10i	Reason(other)	.32	1	.5742	.02	1	.8765
11	Level of satisfaction	NA	NA	NA	NA	NA	NA
Participation in Nature Center Activities and Programs							
13a	Activity(film)	10.13	1	.0015	.13	1	.7217
13b	Activity(exhibits)	.03	1	.8689	.00	1	.9730
13c	Activity(library)	NA	NA	NA	3.47	1	.0626
13d	Activity(self-guided nature trail)	.09	1	.7692	.02	1	.8923
13e	Activity(guided walk)	.01	1	.9152	.12	1	.7337
13f	Activity(guided tour)	.08	1	.7722	.04	1	.8406
12a	Junior Naturalist Program	.06	1	.8084	NV	NV	NV
12b	Conservation Club	NV	NV	NV	1.85	1	.1739
12c	Brookside Nature Photography Contest	NV	NV	NV	NA	NA	NA
12d	Charlie Ecology Program	NV	NV	NV	.04	1	.8502

Appendix 22. Continued

Questionnaire number	Questionnaire item	Brookside x^2	Brookside d.f.	Brookside level of sign.	Meadowside x^2	Meadowside d.f.	Meadowside level of sign.
12e	Arts and crafts workshops	NA	NA	NA	.61	1	.4367
12f	Explorers' Post	NA	NA	NA	.00	1	.9595
—	Total number of activities performed	6.68	5	.2457	2.25	6	.8954
Most and Least Popular Activities							
14	Most-liked activity	NV	NV	NV	NV	NV	NV
15	Least-liked activity	4.77	5	.4446	NV	NV	NV
16	Self-guided nature trail (rating)	NV	NV	NV	NV	NV	NV
Visits to Other Nature Centers							
9a	Brookside Nature Center	NA	NA	NA	1.11	1	.2920
9b	Clearwater Nature Center	.34	1	.5589	.06	1	.8044
9c	Watkins Nature Center	.06	1	.8084	.01	1	.9154
9d	Catoctin Nature Center	.02	1	.8979	.00	1	.9659
9e	Rock Creek Nature Center	.02	1	.8856	.43	1	.5130
9f	Meadowside Nature Center	.01	1	.9404	NA	NA	NA

* NA = not applicable (either the questionnaire item was not on one of the surveys or all responses fell into only one category of a variable)

NV = not valid [the chi-square value did not meet specifications as stated by Snedecor and Cochran (1967)]

Appendix 23. Comparison of control and test groups excluding surveys from 8-12 year olds (non-grouped user survey).

Questionnaire number	Questionnaire item	Brookside x^2	Brookside d.f.	Brookside level of sign.	Meadowside x^2	Meadowside d.f.	Meadowside level of sign.
Characteristics							
1	Age	3.69	5	.5950	10.21	5	.0696
2	Sex	.82	1	.3644	2.40	1	.1212
3	Completed education	1.15	3	.7641	3.10	3	.3771
4	Occupation	5.81	4	.2139	4.06	4	.3977
Parameters of Nature Center Visit							
5	Came with	3.09	4	.5432	2.70	4	.6098
7	Distance	5.13	4	.2746	2.39	4	.6644
8	Number of visits (within last 12 months)	3.23	5	.6648	4.78	5	.4437
10a	Reason (film)	5.66	1	.0174	2.41	1	.1205
10b	Reason (exhibits)	.05	1	.8191	2.50	1	.1136
10c	Reason (guided walk/tour)	.00	1	.9889	.08	1	.7776
10d	Reason (self-guided nature trail)	.72	1	.3957	.12	1	.7339
10e	Reason (visit nature center)	2.33	1	.1269	2.89	1	.0890
10f	Reason (project)	.50	1	.4809	.05	1	.8278
10g	Reason (nature ctr. program)	NV	NV	NV	.07	1	.7967
10h	Reason (library)	NA	NA	NA	1.43	1	.2314
10i	Reason (other)	.07	1	.7947	.04	1	.8481
11	Level of satisfaction	NA	NA	NA	NA	NA	NA
Participation in Nature Center Activities and Programs							
13a	Activity (film)	7.78	1	.0053	.32	1	.5724
13b	Activity (exhibits)	.03	1	.8687	.03	1	.8650
13c	Activity (library)	NA	NA	NA	4.21	1	.0402
13d	Activity (self-guided nature trail)	.00	1	.9925	.00	1	.9683
13e	Activity (guided walk)	.01	1	.9260	.25	1	.6156
13f	Activity (guided tour)	.22	1	.6413	.01	1	.9356
12a	Junior Naturalist Program	.00	1	.9671	NV	NV	NV
12b	Conservation Club	NV	NV	NV	NV	NV	NV
12c	Brookside Nature Photography Contest	NV	NV	NV	NA	NA	NA
12d	Charlie Ecology Program	NV	NV	NV	.08	1	.7825

Appendix 23. Continued

Questionnaire number	Questionnaire item	Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
12e	Arts and crafts workshops	NA	NA	NA	.41	1	.5209
12f	Explorers' Post	NA	NA	NA	.01	1	.9274
--	Total number of activities performed	5.55	5	.3529	2.30	6	.8901
	Most and Least Popular Activities						
14	Most-liked activity	4.93	4	.2951	NV	NV	NV
15	Least-liked activity	3.32	5	.6515	NV	NV	NV
16	Self-guided nature trail (rating)	1.18	2	P>0.050	NV	NV	NV
	Visits to Other Nature Centers						
9a	Brookside Nature Center	NA	NA	NA	1.56	1	.2114
9b	Clearwater Nature Center	.00	1	.9671	.01	1	.9139
9c	Watkins Nature Center	.00	1	.9671	.01	1	.9383
9d	Catoctin Nature Center	.00	1	.9481	.15	1	.6951
9e	Rock Creek Nature Center	.17	1	.6802	.63	1	.4279
9f	Meadowside Nature Center	.02	1	.8863	NA	NA	NA

Appendix 24. One way frequency distributions for questionnaire items on non-grouped user survey (control and test groups combined; based on 165 surveys at Brookside and 178 at Meadowside).

		Brookside		Meadowside	
Questionnaire number	Questionnaire item	Absolute frequency	Percentage (excluding missing)	Absolute frequency	Percentage (excluding missing)
Characteristics					
1	Age				
	13-19 years	44	27.0	46	26.3
	20-29 years	35	21.5	31	17.7
	30-39 years	49	30.1	47	26.9
	40-49 years	19	11.7	27	15.4
	50-59 years	10	6.1	14	8.0
	60 or over	6	3.7	10	5.7
2	Sex				
	male	55	35.3	80	47.3
	female	101	64.7	89	52.7
3	Completed education				
	8th grade	20	12.4	24	13.8
	high school	58	36.0	48	27.6
	college	48	29.8	62	35.6
	graduate school	35	21.7	40	23.0
4	Occupation				
	professional	53	32.9	70	41.2
	technical	12	7.5	15	8.8
	student	55	34.2	50	29.4
	housewife	34	21.1	27	15.9
	other	7	4.3	8	4.7
Parameters of Nature Center Visit					
5	Came with				
	family	93	57.1	97	54.8
	friend	46	28.2	44	24.9
	class	4	2.5	8	4.5
	alone	11	6.7	19	10.7
	family and friend	9	5.5	9	5.1
7	Distance				
	less than 1 mile	12	7.3	7	4.0
	1-2 miles	22	13.4	17	9.6
	3-5 miles	66	40.2	75	42.4
	over 5 miles (but in Md.)	55	33.5	71	40.1
	out of state	9	5.5	7	4.0

Appendix 24. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
8	Number of visits (within last 12 months)				
	0	39	24.1	49	28.0
	1	28	17.3	33	18.9
	2	23	14.2	19	10.9
	3	12	7.4	19	10.9
	4	11	6.8	6	3.4
	5 or more	49	30.2	49	28.0
10a	Reason (film)				
	yes	33	20.2	19	10.7
	no	130	79.8	159	89.3
10b	Reason (exhibits)				
	yes	74	45.4	35	19.7
	no	89	54.6	143	80.3
10c	Reason (guided walk/tour)				
	yes	5	3.1	5	2.8
	no	158	96.9	173	97.2
10d	Reason (self-guided nature trail)				
	yes	42	25.8	99	55.6
	no	121	74.2	79	44.4
10e	Reason (visit nature center)				
	yes	67	41.1	49	27.5
	no	96	58.9	129	72.5
10f	Reason (project)				
	yes	9	5.5	3	1.7
	no	154	94.5	175	98.3
10g	Reason (nature ctr. program)				
	yes	2	1.2	4	2.2
	no	161	98.8	174	97.8
10h	Reason (library)				
	yes	NA	NA	5	2.8
	no	NA	NA	173	97.2
10i	Reason (other)				
	yes	22	13.5	41	23.0
	no	141	86.5	137	77.0

Appendix 24. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
11	Level of satisfaction				
	very satisfied	35	47.9	38	63.3
	satisfied	34	46.6	16	26.7
	mildly dissatisfied	4	5.5	5	8.3
	very dissatisfied	0	0	1	1.7
	Participation in Nature Center Activities and Programs				
13a	Activity(film)				
	yes	83	52.2	80	48.2
	no	76	47.8	86	51.8
13b	Activity(exhibits)				
	yes	141	88.7	129	77.7
	no	18	11.3	37	22.3
13c	Activity(library)				
	yes	NA	NA	37	22.3
	no	NA	NA	129	77.7
13d	Activity(self-guided nature trail)				
	yes	103	64.8	119	71.7
	no	56	35.2	47	28.3
13e	Activity(guided walk)				
	yes	21	13.2	13	7.8
	no	138	86.8	153	92.2
13f	Activity(guided tour)				
	yes	15	9.4	13	7.8
	no	144	90.6	153	92.2
12a	Junior Naturalist Program				
	yes	5	3.0	2	1.2
	no	160	97.0	171	98.8
12b	Conservation Club				
	yes	2	1.2	1	.6
	no	163	98.8	172	99.4

Appendix 24. Continued

Questionnaire number	Questionnaire item	Brookside		Meadowside	
		Absolute frequency	Percentage (excluding missing)	Absolute frequency	Percentage (excluding missing)
12c	Brookside Nature Photography Contest				
	yes	1	.6	NA	NA
	no	164	99.4	NA	NA
12d	Charlie Ecology Program				
	yes	1	.6	3	1.7
	no	164	99.4	170	98.3
12e	Arts and crafts workshops				
	yes	NA	NA	8	4.6
	no	NA	NA	165	95.4
12f	Explorers' Post				
	yes	NA	NA	8	4.6
	no	NA	NA	165	95.4
--	Total number of activities performed				
	less than 2 activities	43	27.1	48	28.9
	2-3 activities	94	59.2	84	50.6
	4 or more activities	22	13.8	34	20.5
Most and Least Popular Activities					
14	Most-liked activity				
	films	11	12.5	7	7.1
	self-guided nature trail	27	30.7	69	69.7
	exhibits	38	43.2	13	13.1
	library	NA	NA	0	0
	guided tour	0	0	2	2.0
	guided walk	6	6.8	5	5.1
	other	6	6.8	3	3.0
15	Least-liked activity				
	films	11	22.0	11	25.0
	self-guided nature trail	4	8.0	3	6.8
	exhibits	9	18.0	3	6.8
	library	NA	NA	14	31.8
	guided tour	19	38.0	8	18.2
	guided walk	4	8.0	3	6.8
	other	3	6.0	2	4.5

Appendix 24. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
16	Self-guided trail (rating)				
	very good	25	32.5	78	65.5
	good	36	46.8	40	33.6
	fair	15	19.5	1	.8
	poor	1	1.3	0	0
	Visits to Other Nature Centers				
9a	Brookside Nature Center				
	yes	NA	NA	113	63.5
	no	NA	NA	65	36.5
9b	Clearwater Nature Center				
	yes	5	3.0	6	3.4
	no	160	97.0	172	96.6
9c	Watkins Nature Center				
	yes	5	3.0	10	5.6
	no	160	97.0	168	94.4
9d	Catoctin Nature Center				
	yes	36	21.8	69	38.8
	no	129	78.2	109	61.2
9e	Rock Creek Nature Center				
	yes	90	54.5	91	51.1
	no	75	45.5	87	48.9
9f	Meadowside Nature Center				
	yes	45	27.3	NA	NA
	no	120	72.7	NA	NA

Appendix 25. One way frequency distributions for questionnaire items on grouped user survey (based on 18 surveys at Brookside and 12 at Meadowside).

Questionnaire number	Questionnaire item	Brookside		Meadowside	
		Absolute frequency	Percentage (excluding missing)	Absolute frequency	Percentage (excluding missing)
Characteristics					
3	Grade (level of group)				
	preschool	5	29.4	2	22.2
	primary	8	47.1	4	44.4
	intermediate	4	23.5	3	33.3
	junior high	0	0	0	0
	high school	0	0	0	0
	college	0	0	0	0
	adult	0	0	0	0
4/5	Type				
	school	12	70.6	1	8.3
	scouting	4	23.5	8	66.7
	handicapped	1	5.9	2	16.7
	other	0	0	1	8.3
6	Size				
	less than 15	4	22.2	9	74.9
	15-20	5	27.8	1	8.3
	21-30	7	38.9	2	16.7
	over 30	2	11.1	0	0
Parameters of Nature Center Visit					
7	Distance				
	less than 3 miles	3	18.8	1	9.1
	3-5 miles	7	43.8	4	36.4
	6-10 miles	0	0	6	54.5
	11-20 miles	4	25.0	0	0
	over 20 miles	2	12.5	0	0
8	Visit (how often)				
	first visit	4	22.2	3	30.0
	annual visit	12	66.7	3	30.0
	visit more than once a year	2	11.1	4	40.0
9	Unit of study				
	yes	14	77.8	5	45.5
	no	4	22.2	6	54.5

Appendix 25. Continued

Questionnaire/Questionnaire number item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
10 Preparatory lecture or pre-test				
yes	10	55.6	4	36.4
no	8	44.4	7	63.6
11 Written evaluation				
yes	7	38.9	3	27.3
no	11	61.1	8	72.7
Participation in Nature Center Activities				
12a Activity(film)				
yes	14	77.8	9	75.0
no	4	22.2	3	25.0
12b Activity(exhibits)				
yes	18	100.0	7	58.3
no	0	0	5	41.7
12c Activity(library)				
yes	NA	NA	1	8.3
no	NA	NA	11	91.7
12d Activity(self-guided nature trail)				
yes	8	44.4	5	41.7
no	10	55.6	7	58.3
12e Activity(guided walk)				
yes	4	22.2	5	41.7
no	14	77.8	7	58.3
12f Activity(guided tour)				
yes	13	72.2	2	16.7
no	5	27.8	10	83.3
12g Activity(hike other trails)				
yes	0	0	1	8.3
no	18	100.0	11	91.7
12h Activity(other)				
yes	4	22.2	1	8.3
no	14	77.8	11	91.7

Appendix 25. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
--	Total number of activities performed				
	less than 2 activities	0	0	2	16.7
	2-3 activities	12	66.7	8	66.7
	4 or more activities	6	33.3	2	16.6
Most and Least Popular Activities					
13	Most-liked activity				
	films	1	8.3	0	0
	self-guided nature trail	0	0	1	12.5
	exhibits	2	16.7	0	0
	library	NA	NA	0	0
	guided tour	6	50.0	2	25.0
	guided walk	1	8.3	4	50.0
	other	2	16.7	1	12.5
14	Least-liked activity				
	films	1	14.3	0	0
	self-guided nature trail	3	42.9	0	0
	exhibits	2	28.6	2	40.0
	library	1	14.3	3	60.0
	guided tour	0	0	0	0
	guided walk	0	0	0	0
	other	0	0	0	0
15	Guided walk/tour (rating)				
	very good	14	87.5	4	57.1
	good	1	6.3	3	42.9
	fair	1	6.3	0	0
	poor	0	0	0	0
15a	Naturalist preparation				
	very well	12	75.0	5	62.5
	well	3	18.8	3	37.5
	fair	1	6.3	0	0
	poorly prepared	0	0	0	0

Appendix 25. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
Objectives of Group Leaders					
17	Objectives (fulfilled)				
	very well	13	76.5	3	33.3
	well	3	17.6	6	66.7
	fair	1	5.9	0	0
	poorly	0	0	0	0

Appendix 26. One way frequency distributions for questionnaire items on staff survey (based on 9 surveys at Brookside and 8 at Meadowside).

Questionnaire/ number	Questionnaire item	Brookside		Meadowside	
		Absolute frequency	Percentage (excluding missing)	Absolute frequency	Percentage (excluding missing)
Characteristics					
2	Experience				
	less than 2 years	1	11.1	3	37.5
	2-5 years	4	44.4	1	12.5
	6-10 years	2	22.2	3	37.5
	over 10 years	2	22.2	1	12.5
3	Completed education				
	high school	2	22.2	1	12.5
	1 year college	0	0	0	0
	2 years college	1	11.1	1	12.5
	3 years college	1	11.1	1	12.5
	bachelors degree	5	55.6	5	62.5
	advanced degree	0	0	0	0
Perception of Clientele Interests and Needs					
4	Reason				
	film	0	0	0	0
	exhibits	0	0	0	0
	guided walk/tour	2	22.2	5	83.3
	self-guided nature trail	0	0	0	0
	visit nature center	7	77.8	1	16.7
	project	0	0	0	0
	nature center program	0	0	0	0
	library	0	0	0	0
	other	0	0	0	0
5	Most-liked activity				
	films	1	12.5	0	0
	self-guided nature trail	0	0	1	14.3
	exhibits	1	12.5	0	0
	library	0	0	0	0
	guided tour	0	0	0	0
	guided walk	6	75.0	6	85.7
	other	0	0	0	0

Appendix 26. Continued

Questionnaire number	Questionnaire item	Brookside Absolute frequency	Brookside Percentage (excluding missing)	Meadowside Absolute frequency	Meadowside Percentage (excluding missing)
6	Least-liked activity				
	films	3	37.5	1	12.5
	self-guided nature trail	1	12.5	0	0
	exhibits	1	12.5	4	50.0
	library	2	25.0	2	25.0
	guided tour	0	0	0	0
	guided walk	0	0	0	0
	other	1	12.5	1	12.5

Appendix 27. One way frequency distributions for questionnaire items on potential user survey (based on 98 surveys).

Questionnaire number	Questionnaire item	Absolute frequency	Percentage (excluding missing)
Characteristics			
9	Age		
	13-19 years	1	1.1
	20-29 years	14	16.1
	30-39 years	20	23.0
	40-49 years	14	16.1
	50-59 years	9	10.3
	60 or over	29	33.3
10	Sex		
	male	21	21.9
	female	75	78.1
11	Completed education		
	8th	8	9.0
	high school	41	46.1
	college	26	29.2
	graduate school	14	15.7
12	Occupation		
	professional	19	22.6
	technical	18	21.4
	student	7	8.3
	housewife	28	33.3
	other	12	14.3
13a	Distance from Brookside		
	3 or less miles	15	20.8
	3.1-5 miles	27	37.5
	5.1-8 miles	22	30.6
	8.1-11 miles	4	5.6
	over 11 miles	4	5.6
13b	Distance from Meadowside		
	3 or less miles	9	12.5
	3.1-5 miles	13	18.0
	5.1-8 miles	22	30.6
	8.1-11 miles	27	37.5
	over 11 miles	1	1.4

Appendix 27. Continued

Questionnaire number	Questionnaire item	Absolute frequency	Percentage (excluding missing)
	Knowledge of the Brookside and Meadowside Nature Centers		
1a	Ever heard of Brookside		
	yes	36	36.7
	no	62	63.3
1b	Ever heard of Meadowside		
	yes	12	12.5
	no	84	87.5
2	Learn about center		
	through a visit	4	11.1
	through friends, neighbors, relatives or family	17	47.2
	through radio, television, newspapers or pamphlets	6	16.7
	other	9	25.0
4b	Ever visited Brookside		
	yes	19	52.8
	no	17	47.2
4c	Visited Brookside (within last 12 months)		
	yes	12	63.2
	no	7	36.8
4d	Ever visited Meadowside		
	yes	5	38.5
	no	8	61.5
4e	Visited Meadowside (within last 12 months)		
	yes	3	60.0
	no	2	40.0
4a	Reason for not visiting		
	no time available	7	41.2
	inconvenient hours	1	5.9
	no interest or need	3	17.6
	too far away	0	0
	other	6	35.3
8	Have any children		
	yes	52	57.8
	no	38	42.2

Appendix 27. Continued

Questionnaire number	Questionnaire item	Absolute frequency	Percentage (excluding missing)
8a	Children ever visited either center		
	yes	10	27.8
	no	26	72.2
3a	Activity(film)		
	yes	5	12.2
	no	36	87.8
3b	Activity(exhibits)		
	yes	19	46.3
	no	22	53.7
3c	Activity(library)		
	yes	5	12.2
	no	36	87.8
3d	Activity(self-guided nature trail)		
	yes	17	41.5
	no	24	58.5
3e	Activity(guided walk/tour)		
	yes	5	12.2
	no	36	87.8
3f	Junior Naturalist Program		
	yes	0	0
	no	41	100.0
3g	Conservation Club		
	yes	0	0
	no	41	100.0
3h	Brookside Nature Photography Contest		
	yes	0	0
	no	41	100.0
3i	Charlie Ecology Program		
	yes	0	0
	no	41	100.0
3j	Arts and crafts workshops		
	yes	4	9.8
	no	37	90.2

Appendix 27. Continued

Questionnaire/Questionnaire number item		Absolute frequency	Percentage (excluding missing)
3k	Explorers' Post		
	yes	0	0
	no	41	100.0
Perception of Nature Centers in General			
5a	Children		
	agree	10	10.3
	disagree	78	80.4
	don't know	9	9.3
5b	Plants and animals		
	agree	10	10.4
	disagree	79	82.3
	don't know	7	7.3
5c	Free time		
	agree	17	18.1
	disagree	74	78.7
	don't know	3	3.2
5d	Natural environment		
	agree	93	98.9
	disagree	1	1.1
	don't know	0	0
Most and Least Popular Topics			
6	Most-liked topic		
	plants	44	50.0
	animals	18	20.5
	geology	2	2.3
	general ecology	4	4.5
	environmental problems	4	4.5
	climatic and weather conditions	4	4.5
	pioneer life	2	2.3
	none	10	11.4

Appendix 27. Continued

Questionnaire/Questionnaire number item	Absolute frequency	Percentage (excluding missing)
7 Least-liked topic		
plants	3	3.4
animals	0	0
geology	17	19.1
general ecology	3	3.4
environmental problems	2	2.2
climatic and weather conditions	26	29.2
pioneer life	13	14.6
none	25	28.1

Appendix 28. Comparison of Brookside non-grouped users and Meadowside non-grouped users.

Questionnaire number	Questionnaire item	x^2	d.f.	level of sign.
Characteristics				
1	Age	2.96	5	.7055
2	Sex	4.39	1	.0361
3	Completed education	2.92	3	.4038
4	Occupation	3.55	4	.4705
Parameters of Nature Center Visit				
5	Came with	3.02	4	.5538
7	Distance	4.32	4	.3640
8	Number of visits (within last 12 months)	4.48	5	.4821
10a	Reason (film)	5.31	1	.0212
10b	Reason (exhibits)	24.74	1	.0000
10c	Reason (guided walk/tour)	.03	1	.8572
10d	Reason (self-guided nature trail)	30.04	1	.0000
10e	Reason (visit nature center)	6.40	1	.0114
10f	Reason (project)	2.64	1	.1039
10g	Reason (nature center program)	.09	1	.7615
10h	Reason (library)	NA	NA	NA
10i	Reason (other)	4.52	1	.0334
11	Level of satisfaction	NV	NV	NV
Participation in Nature Center Activities and Programs				
13a	Activity (film)	.37	1	.5409
13b	Activity (exhibits)	6.19	1	.0128
13c	Activity (library)	NA	NA	NA
13d	Activity (self-guided nature trail)	1.48	1	.2230
13e	Activity (guided walk)	1.96	1	.1610
13f	Activity (guided tour)	.10	1	.7513
12a	Junior Naturalist Program	.68	1	.4080
12b	Conservation Club	.00	1	.9671
12c	Brookside Nature Photography Contest	NA	NA	NA
12d	Charlie Ecology Program	.21	1	.6488
12e	Arts and crafts workshops	NA	NA	NA
12f	Explorers' Post	NA	NA	NA
--	Total number of activities performed	6.59	6	.3604

Appendix 28. Continued

Questionnaire/Questionnaire number	item	x^2	d.f.	level of sign.
Most and Least Popular Activities				
14	Most-liked activity	34.08	5	.0000
15	Least-liked activity	21.67	6	.0014
16	Self-guided nature trail(rating)	12.88	2	P<0.005
Visits to Other Nature Centers				
9a	Brookside Nature Center	NA	NA	NA
9b	Clearwater Nature Center	.02	1	.8983
9c	Watkins Nature Center	.82	1	.3646
9d	Catoctin Nature Center	10.79	1	.0010
9e	Rock Creek Nature Center	.28	1	.5989
9f	Meadowside Nature Center	NA	NA	NA

Appendix 29. Comparison of Brookside and Meadowside grouped users.*

Questionnaire number	Questionnaire item	Fisher's exact test (level of sign.)
Characteristics		
3	Grade (preschool vs. older than preschool)	.5376
4/5	Type (school vs. scouting)	.0142
6	Size ($a < 15 \le b$)	.0061
Parameters of Nature Center Visit		
7	Distance ($a < 6$ miles $\le b$)	.2085
8	Visit (1st visit vs. 1 or more visits a year)	.4907
9	Unit of study	.0853
10	Preparatory lecture or pre-test	.2683
11	Written evaluation	.4112
Participation in Nature Center Activities		
12a	Activity (film)	.5972
12b	Activity (exhibits)	.0056
12c	Activity (library)	NA
12d	Activity (self-guided nature trail)	.5902
12e	Activity (guided walk)	.2312
12f	Activity (guided tour)	.0039
12g	Activity (hike other trails)	.4000
12h	Activity (other)	.3178
--	Total number of activities performed ($a < 4 \le b$)	.2821
Most and Least Popular Activities		
13	Most-liked activity (sedentary vs. active)	.1277
13	Most-liked activity (staff involvement vs. no staff involvement)	.5346
13	Most-liked activity (inside vs. outside)	.0072
14	Least-liked activity (sedentary vs. active)	.1591
14	Least-liked activity (staff involvement vs. no staff involvement)	.5833
14	Least-liked activity (inside vs. outside)	.1591
15	Guided walk/tour (rating) (very good vs. good, fair)	.1421
15a	Naturalist preparation (very well vs. well, fair)	.4285

* only 2 x 2 tables are used due to the small sample size

Appendix 29. Continued

Questionnaire number	Questionnaire item	Fisher's exact test (level of sign.)
Objectives of Group Leaders		
17	Objectives (very well vs. well, fair)	.0425

Appendix 30. Comparison of Brookside and Meadowside staff.*

Questionnaire number	Questionnaire item	Fisher's exact test (level of sign.)
Characteristics		
2	Experience (a < 5 years ≤ b)	.6008
3	Completed education (a < bachelor's degree ≤ b)	.5806
Perception of Clientele Interests and Needs		
4a	Reason (film)	NA
4b	Reason (exhibits)	NA
4c	Reason (guided walk/tour)	.0122
4d	Reason (self-guided nature trail)	.4706
4e	Reason (visit nature center)	.0445
4f	Reason (project)	NA
4g	Reason (nature center program)	NA
4h	Reason (library)	NA
4i	Reason (other)	NA
5	Most-liked activity (sedentary vs. active)	.1235
5	Most-liked activity (staff involvement vs. no staff involvement)	1.0000
5	Most-liked activity (inside vs. outside)	.1500
6	Least-liked activity (sedentary vs. active)	.5000
6	Least-liked activity (staff involvement vs. no staff involvement)	.3385
6	Least-liked activity (inside vs. outside)	.5000

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* only 2 x 2 tables are used due to the small sample size

Appendix 31. Comparison of non-grouped users and potential users (survey data).

Questionnaire item	x^2	d.f.	level of sign.
Age	76.84	5	.0000
Sex	11.46	1	.0007
Completed education	6.98	3	.0726
Occupation	45.34	4	.0000

Appendix 32. Comparison of non-grouped users and potential users (1974 census update information).

	Brookside			Meadowside		
Questionnaire item	x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Age	46.23	4	$P<0.005$	28.67	4	$P<0.005$
Sex	5.47	1	$P<0.025$	.60	1	$P>0.050$
Completed education	41.46	2	$P<0.005$	78.02	2	$P<0.005$
Occupation	NA	NA	NA	NA	NA	NA

Appendix 33. One way frequency distributions for potential users (survey data and 1974 census update information).*

Questionnaire item	Potential users (survey data)		Montgomery County residents	
	Absolute frequency	Percentage (excluding missing)	Absolute frequency	Percentage (excluding missing)
Age				
20-29	14	16.3	90,280	23.5
30-39	20	23.3	77,350	20.2
40-49	14	16.3	75,050	19.6
50-59	9	10.5	71,750	18.7
60 or over	29	33.7	68,620	17.9
Sex				
male	21	21.9	181,610	47.4
female	75	78.1	201,440	52.6
Completed education				
not completed high school	8	9.0	38,400	12.6
high school	41	46.1	138,600	45.6
college	40	44.9	127,100	41.8

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* data represent only those over 19 years of age with the exception of data concerning the education of Montgomery County residents which represent those over 24 years of age

Appendix 34. Comparison of survey data and 1974 census update information (potential users).

Questionnaire item	x^2	d.f.	level of sign.
Age	17.94	4	$P<0.010$
Sex	25.10	1	$P<0.005$
Completed education	1.14	2	$P>0.050$

Appendix 35. One way frequency distributions for age of non-grouped users and potential users (1974 census update information).*

	Montgomery County residents		Brookside non-grouped users		Meadowside non-grouped users	
AGE	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)
20-29	90,280	23.5	35	29.4	31	24.0
30-39	77,350	20.2	49	41.2	47	36.4
40-49	75,050	19.6	19	16.0	27	20.9
50-59	71,750	18.7	10	8.4	14	10.9
60 or over	68,620	17.9	6	5.0	10	7.8

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* data represent only those over 19 years of age

Appendix 36. One way frequency distributions for sex of non-grouped users and potential users (1974 census update information).*

	Montgomery County residents		Brookside non-grouped users		Meadowside non-grouped users	
SEX	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)
male	181,610	47.4	42	36.5	54	43.9
female	201,440	52.6	73	63.5	69	56.1

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* data represent only those over 19 years of age

Appendix 37. One way frequency distributions for educational level of non-grouped users and potential users (1974 census update information).*

	Montgomery County residents		Brookside non-grouped users		Meadowside non-grouped users	
EDUCATION LEVEL	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)	Absolute frequency	Percent. (exclud. missing)
not completed high sch.	38,400	12.6	1	.8	0	0
completed high sch.	138,600	45.6	36	30.3	26	20.3
completed college	127,100	41.8	82	68.9	102	79.7

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* data for Montgomery County residents represent only those over 24 years of age while data for nature center users represent only those over 19 years of age

* figures from the 1974 census update information do not include the 1.2% of the population who live in group quarters

Appendix 38. Comparison of non-grouped users and grouped users.

Questionnaire item	Brookside x^2	Brookside d.f.	Brookside level of sign.	Meadowside x^2	Meadowside d.f.	Meadowside level of sign.
Activity(film)	3.30	1	.0693	2.23	1	.1350
Activity(exhibits)	1.20	1	.2736	1.38	1	.2401
Activity(library)	NA	NA	NA	.60	1	.4386
Activity(self-guided nature trail)	2.06	1	.1516	3.46	1	.0630
Activity(guided walk)	.47	1	.4941	10.62	1	.0011
Activity(guided tour)	43.27	1	.0000	.28	1	.5989
Activity(hike other trails)	NA	NA	NA	NA	NA	NA
Activity(other)	NA	NA	NA	NA	NA	NA
Most-liked activity (sedentary vs. active)	2.55	1	.1103	.77	1	.3795
Most-liked activity (staff involvement vs. no staff involvement)	15.50	1	.0001	16.32	1	.0001
Most-liked activity (inside vs. outside)	3.08	1	.0792	.03	1	.8656
Least-liked activity (sedentary vs. active)	.14	1	.7051	1.30	1	.2543
Least-liked activity (staff involvement vs. no staff involvement)	7.16	1	.0075	3.39	1	.0658
Least-liked activity (inside vs. outside)	1.10	1	.2948	NV	NV	NV

Appendix 39. Comparison of staff and non-grouped users.

Questionnaire item	Brookside x^2	Brookside d.f.	Brookside level of sign.	Meadowside x^2	Meadowside d.f.	Meadowside level of sign.
Reason (film)	1.14	1	.2861	NV	NV	NV
Reason (exhibits)	5.44	1	.0197	.86	1	.3526
Reason (guided walk/tour)	NV	NV	NV	NV	NV	NV
Reason (self-guided nature trail)	1.83	1	.1760	4.12	1	.0423
Reason (visit nature center)	3.30	1	.0692	.06	1	.8039
Reason (project)	NV	NV	NV	NV	NV	NV
Reason (nature ctr. program)	NV	NV	NV	NV	NV	NV
Reason (library)	NA	NA	NA	NV	NV	NV
Reason (other)	.45	1	.5044	1.21	1	.2707
Most-liked activity (sedentary vs. active)	1.75	1	.1854	1.00	1	.3176
Most-liked activity (staff involvement vs. no staff involvement)	11.95	1	.0005	23.63	1	.0000
Most-liked activity (inside vs. outside)	2.01	1	.1559	.98	1	.3210
Least-liked activity (sedentary vs. active)	3.19	1	.0740	2.21	1	.1369
Least-liked activity (staff involvement vs. no staff involvement)	2.67	1	.1022	2.47	1	.1159
Least-liked activity (inside vs. outside)	.11	1	.7366	NV	NV	NV

Appendix 40. Comparison of staff and grouped users.

Questionnaire item	Brookside Fisher's exact test (level of sign.)	Meadowside Fisher's exact test (level of sign.)
Most-liked activity (sedentary vs. active)	1.0000	NA
Most-liked activity (staff involvement vs. no staff involvement)	.6561	.5000
Most-liked activity (inside vs. outside)	.0066	.2308
Least-liked activity (sedentary vs. active)	.2797	NA
Least-liked activity (staff involvement vs. no staff involvement)	.3385	.5833
Least-liked activity (inside vs. outside)	.2797	NA

Appendix 41. Associations between responses to different questions by non-grouped users.

Two questionnaire items being compared		Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Age (13-29 vs. 40 or over)	Reason (film)	1.95	1	.1626	.01	1	.9224
	Reason (exhibits)*	3.71	1	.0541	.27	1	.6032
	Reason (guided walk/ tour)	NV	NV	NV	.14	1	.7076
	Reason (self-guided nature trail)	.16	1	.6892	.08	1	.7726
	Reason (visit nature center)	.45	1	.5006	.43	1	.5115
	Reason (project)	.50	1	.4777	.14	1	.7076
	Reason (nature center program)	NV	NV	NV	.14	1	.7076
	Reason (library)	NA	NA	NA	.20	1	.6565
	Reason (other)	4.21	1	.0402	.04	1	.8515
	Activity (film)	.10	1	.7573	.56	1	.4556
	Activity (exhibits)	.06	1	.8137	1.28	1	.2580
	Activity (library)	NA	NA	NA	1.28	1	.2580
	Activity (self-guided nature trail)	.83	1	.3625	.01	1	.9057
	Activity (guided walk)	3.47	1	.0626	2.12	1	.1451
	Activity (guided tour)	4.72	1	.0298	1.54	1	.2139
	Most-liked activity (sed. vs. active)	4.52	1	.0334	.02	1	.8781
	Most-liked activity (staff inv. vs. no staff inv.)	.00	1	.9575	.64	1	.4224
	Most-liked activity (inside vs. outsd.)	3.41	1	.0646	.04	1	.8379
	Least-liked activity sed. vs. active)	2.12	1	.1454	1.53	1	.2167
	Least-liked activity (staff inv. vs. no staff inv.)	.23	1	.6323	.00	1	.9811
	Least-liked activity (inside vs. outsd.)	NV	NV	NV	.78	1	.3771

* this relationship is significant at Brookside when surveys from 30-39 year olds are included with surveys from those between 13 and 29 years of age ($P<0.05$)

Appendix 41. Continued

Two questionnaire items being compared		Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Sex	Reason (film)	.25	1	.6147	.63	1	.4280
	Reason (exhibits)	1.50	1	.2213	.00	1	.9794
	Reason (guided walk/ tour)	.02	1	.8953	.01	1	.9036
	Reason (self-guided nature trail)	.00	1	.9758	.24	1	.6260
	Reason (visit nature center)	3.65	1	.0562	.01	1	.9396
	Reason (project)	.08	1	.7710	.01	1	.9257
	Reason (nature center program)	NV	NV	NV	.16	1	.6900
	Reason (library)	NA	NA	NA	.62	1	.4306
	Reason (other)	.04	1	.8467	.04	1	.8377
	Activity (film)	.07	1	.7923	.14	1	.7129
	Activity (exhibits)	.06	1	.8012	.01	1	.9085
	Activity (library)	NA	NA	NA	.47	1	.4943
	Activity (self-guided nature trail)	1.59	1	.2071	2.47	1	.1162
	Activity (guided walk)	.31	1	.5779	.02	1	.8888
	Activity (guided tour)	1.62	1	.2026	.56	1	.4546
	Most-liked activity (sed. vs. active)	.01	1	.9335	.23	1	.6295
	Most-liked activity (staff inv. vs. no staff inv.)	.11	1	.7426	.01	1	.9103
	Most-liked activity (inside vs. outsd.)	.00	1	.9856	.00	1	.9657
	Least-liked activity (sed. vs. active)	.76	1	.3828	.02	1	.8861
	Least-liked activity (staff inv. vs. no staff inv.)	.27	1	.6040	3.17	1	.0751
	Least-liked activity (inside vs. outsd.)	.03	1	.8709	.08	1	.7786
Completed education (a < college ≤ b)	Reason (film)	1.41	1	.2356	.11	1	.7433
	Reason (exhibits)	.00	1	.9625	1.38	1	.2400
	Reason (guided walk/ tour)	.01	1	.9430	.16	1	.6866

Appendix 41. Continued

Two questionnaire items being compared		Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Completed education ($a <$ college $\leq b$)	Reason (self-guided nature trail)	.02	1	.8974	.41	1	.5225
	Reason (visit nature center)	.03	1	.8625	.85	1	.3552
	Reason (project)	.35	1	.5555	.10	1	.7560
	Reason (nature center program)	NV	NV	NV	.02	1	.8778
	Reason (library)	NA	NA	NA	.16	1	.6866
	Reason (other)	1.19	1	.2748	.02	1	.8821
	Activity (film)	.67	1	.4131	.61	1	.4364
	Activity (exhibits)	.13	1	.7141	.59	1	.4430
	Activity (library)	NA	NA	NA	1.31	1	.2520
	Activity (self-guided nature trail)	1.59	1	.2066	.16	1	.6864
	Activity (guided walk)	7.61	1	.0058	.39	1	.5332
	Activity (guided tour)	4.25	1	.0392	.00	1	.9703
	Most-liked activity (sed. vs. active)	.04	1	.8330	1.62	1	.2028
	Most-liked activity (staff inv. vs. no staff inv.)	.92	1	.3372	.05	1	.8185
	Most-liked activity (inside vs. outsd.)	.02	1	.8760	.52	1	.4694
	Least-liked activity (sed. vs. active)	1.07	1	.3007	.10	1	.7540
	Least-liked activity (staff inv. vs. no staff inv.)	1.21	1	.2707	.40	1	.5263
	Least-liked activity (inside vs. outsd.)	.10	1	.7485	.00	1	.9464
Times ($a < 3 \leq b$)	Distance ($a \leq 5 < b$)	3.57	1	.0590	6.48	1	.0109
	Reason (film)	18.71	1	.0000	10.11	1	.0015
	Reason (exhibits)	9.61	1	.0019	.25	1	.6190
	Reason (guided walk/tour)	1.24	1	.2662	.13	1	.7231
	Reason (self-guided nature trail)	.08	1	.7729	2.85	1	.0914
	Reason (visit nature center)	.14	1	.7086	.23	1	.6352

Appendix 41. Continued

Two questionnaire items being compared		Brookside			Meadowside		
		x^2	d.f.	level of sign.	x^2	d.f.	level of sign.
Times ($a < 3 \leq b$)	Reason (project)	.17	1	.6762	.07	1	.7850
	Reason (nature center program)	NV	NV	NV	.69	1	.4077
	Reason (library)	NA	NA	NA	.13	1	.7231
	Reason (other)	.05	1	.8312	.18	1	.6744
	Most-liked activity (sed. vs. active)	.06	1	.8130	5.88	1	.0153
	Most-liked activity (staff inv. vs. no staff inv.)	.97	1	.3248	.39	1	.5347
	Most-liked activity (inside vs. outsd.)	.01	1	.9387	7.01	1	.0081
	Least-liked activity (sed. vs. active)	1.39	1	.2376	1.45	1	.2291
	Least-liked activity (staff inv. vs. no staff inv.)	.32	1	.5718	2.01	1	.1560
	Least-liked activity (inside vs. outsd.)	2.33	1	.1271	1.89	1	.1692
	Brookside Nature Ctr.	NA	NA	NA	5.77	1	.0163
	Clearwater Nature Ctr.	.09	1	.7583	.66	1	.4181
	Watkins Nature Ctr.	.47	1	.4917	.03	1	.8580
	Catoctin Nature Ctr.	.01	1	.9170	7.54	1	.0060
	Rock Creek Nature Ctr.	2.36	1	.1245	3.22	1	.0726
	Meadowside Nature Ctr.	2.75	1	.0971	NA	NA	NA
Level of satisfaction (very sat. vs. sat., mildly dissat.)	Reason (film)	.59	1	.4411	.00	1	.9657
	Reason (exhibits)	.02	1	.8952	.24	1	.6224
	Reason (guided walk/tour)	NV	NV	NV	NV	NV	NV
	Reason (self-guided nature trail)	.04	1	.8465	3.16	1	.0755
	Reason (visit nature center)	.07	1	.7903	.56	1	.4544
	Reason (project)	1.92	1	.1662	NV	NV	NV
	Reason (nature center program)	NA	NA	NA	NV	NV	NV
	Reason (library)	NA	NA	NA	.01	1	.9343
	Reason (other)	.04	1	.8409	.01	1	.9199

Appendix 42. Associations between responses to different questions by grouped users.

Two questionnaire items being compared		Brookside	Meadowside
		Fisher's exact test (level of sign.)	Fisher's exact test (level of sign.)
Grade (preschool vs. older than preschool)	Unit of study	.3298	.7222
	Preparatory lecture or pre-test	.3145	.5833
	Written evaluation	.2783	.5833
	Activity(film)	.6702	.5833
	Activity(exhibits)	NA	.7222
	Activity(library)	NA	.7778
	Activity(self-guided nature trail)	.4367	.7222
	Activity(guided walk)	.2080	.7222
	Activity(guided tour)	.5280	.2222
	Activity(hike other trails)	NA	.7778
	Activity(other)	NA	NA
	Most-liked activity (sed. vs. active)	.7212	NA
	Most-liked activity (staff inv. vs. no staff inv.)	.6182	.6000
	Most-liked activity (inside vs. outsd.)	.6667	.6000
	Least-liked activity (sed. vs. active)	.5000	NA
	Least-liked activity (staff inv. vs. no staff inv.)	.5000	NA
	Least-liked activity (inside vs. outsd.)	.5000	NA
	Objectives (very good vs. good, fair)	.6346	.2857
	Total number of activities performed ($a < 4 \leq b$)	.3946	.4167
Type (school vs. scouting)	Unit of study	.5794	.4243
	Preparatory lecture or pre-test	.1618	.2788
	Written evaluation	.5588	.1515

Appendix 42. Continued

Two questionnaire items being compared		Brookside Fisher's exact test (level of sign.)	Meadowside Fisher's exact test (level of sign.)
Type (school vs. scouting)	Activity(film)	.3004	.4909
	Activity(exhibits)	NA	.7212
	Activity(library)	NA	.7273
	Activity(self-guided nature trail)	.4412	.4242
	Activity(guided walk)	.0223	.5758
	Activity(guided tour)	.2189	.4909
	Activity(hike other trails)	NA	.7273
	Activity(other)	NA	NA
	Most-liked activity (sed. vs. active)	.4243	NA
	Most-liked activity (staff inv. vs. no staff inv.)	.5455	.1071
	Most-liked activity (inside vs. outsd.)	.1539	.4762
	Least-liked activity (sed. vs. active)	.5714	NA
	Least-liked activity (staff inv. vs. no staff inv.)	.1429	NA
	Least-liked activity (inside vs. outsd.)	.5714	NA
	Objectives (very good vs. good, fair)	.0714	.5833
	Total number of activities performed ($a < 4 \leq b$)	.4454	.4909

Appendix 43. Associations between responses to different questions by potential users.[*]

Two questionnaire items being compared		x^2	d.f.	level of sign.
Age (13-39 vs. 40 or over)	Ever heard of Brookside	.01	1	.9071
	Ever heard of Meadowside	.41	1	.5239
	Ever visited Brookside	.07	1	.7876
	Ever visited Meadowside			.6894
	Most-liked topic (plants vs. animals)	1.25	1	.2632
	Least-liked topic (geology vs. climatic and weather conditions vs. pioneer life)	1.87	2	.3924
Sex	Ever heard of Brookside	.04	1	.8483
	Ever heard of Meadowside	.02	1	.8932
	Ever visited Brookside	.03	1	.8697
	Ever visited Meadowside			.3590
	Most-liked topic (plants vs. animals)	.20	1	.6525
	Least-liked topic (geology vs. climatic and weather conditions vs. pioneer life)	3.26	2	.1962
Completed education ($a <$ college $\leq b$)	Ever heard of Brookside	7.44	1	.0064
	Ever heard of Meadowside	.01	1	.9399
	Ever visited Brookside	.33	1	.5660
	Ever visited Meadowside			.0319
	Most-liked topic (plants vs. animals)	.64	1	.4255
	Least-liked topic (geology vs. climatic and weather conditions vs. pioneer life)	.68	2	.7121
Distance from Brookside ($a \leq 6 < b$)	Ever heard of Brookside	1.12	1	.2893
	Ever visited Brookside			.1373
	Visited Brookside (within last 12 months)			.6571
	Learn about center			.6207

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[*] only the level of significance is cited when Fisher's exact test is used

Appendix 43. Continued

Two questionnaire items being compared		x^2	d.f.	level of sign.
Distance from Meadowside ($a \leq 6 < b$)	Ever heard of Meadowside	.99	1	.3202
	Ever visited Meadowside			1.0000
	Visited Meadowside (within last 12 months)			1.000
	Learn about center			.50
Most-liked topic (plants vs. animals)	Ever visited Brookside			[illegible]
	Ever visited Meadowside			.6667
	Visited Brookside (within last 12 months)			.0600
	Visited Meadowside (within last 12 months)			.5000
Least-liked topic (geology vs. climatic and weather conditions vs. pioneer life)	Ever visited Brookside	2.40	2	.3012
	Ever visited Meadowside	3.06	2	.2170
	Visited Brookside (within last 12 months)	NV	NV	NV
	Visited Meadowside (within last 12 months)			1.0000

Appendix 44. Recommendations of non-grouped clientele at Brookside Nature Center.

Questionnaire number	Questionnaire item	Number of comments
18	Most Beneficial Improvement	
	Exhibits	
	change them more often	16
	more needed	10
	need to be more realistic	4
	need more information with them	4
	more sensory exhibits needed	2
	other	3
	Trails	
	improve signs on self-guided nature trail	7
	extend the trails	5
	clean up the trails	3
	other	1
	Talks by a naturalist needed	21
	Films	
	should be shown continuously	5
	need to be longer	3
	should be shown on weekdays	2
	Live animals needed	16
	Other	7
	Total	109

Appendix 45. Recommendations of non-grouped clientele at Meadowside Nature Center.

Questionnaire number	Questionnaire item	Number of comments
18	Most Beneficial Improvement	
	Exhibits	
	more needed	18
	more sensory exhibits needed (including stuffed animals)	3
	Trails	
	need more information to be placed on the trails	12
	extend the trails	4
	more trails needed	3
	need rest spots on the trail	3
	Talks by a naturalist needed	11
	Films	
	improve quality	3
	more needed	3
	other	1
	Live animals needed	8
	Library or laboratory was not open for public use	5
	Remove old tires from the stream	6
	Need to be open on weekday nights and earlier on Sunday	4
	Other	7
	Total	91

Appendix 46. Recommendations of group leaders at both nature centers.

Questionnaire number	Questionnaire item	Number of comments
9	Topic Being Studied in Conjunction with Visit	
	Season orientated material	8
	Nature	2
	Outdoor education	2
	Other	5
16	Learning Objectives for Group	
	Development of observational skills (e.g. identification of flora and fauna)	8
	Study forest animals	2
	Study ecological relationships	2
	Other	11
19	General Comments	
	Desire for live animals at the center	3
	Appreciation of stuffed animals	2
	Other	4

Appendix 47. Recommendations of staff at Brookside Nature Center.

Questionnaire number	Questionnaire item	Number of comments
7	The Most Critical Need for the Nature Center	
	Establish diversified programs	3
	Create sensory exhibits	3
	Other	3
--	How Could Each of the Following be Improved?	
	Exhibits	
	make new exhibits	3
	create sensory exhibits	2
	other	2
	Trails	
	have new trail guides for different seasons	2
	new trails needed	2
	Guided walks with a naturalist (also building exhibit tours)	
	weekend walks (and campfires) needed	2
	other	3
	Films	
	have better selection, and thus, variety in films	4
	preview the films	3
	other	1
8	Unreached Segment of the Population	
	Handicapped	4
	Other	2
--	What Needed to Reach the Above	
	Trails, buildings and programs need to be modified for the handicapped	3
	Evening (and night) and weekend programs	2
	Other	2

Appendix 47. Continued

Questionnaire number	Questionnaire item	Number of comments
9	Major Contribution of the Nature Center to the Community	
	It gets people involved in nature	6
	It is an information facility	4
	Other	3

Appendix 48. Recommendations of staff at Meadowside Nature Center.

Questionnaire number	Questionnaire item	Number of comments
7	The Most Critical Need for the Nature Center	
	Obtain extra staff help	2
	Other	6
--	How Could Each of the Following be Improved?	
	Exhibits	
	obtain more "people involvement"	2
	change them more often (e.g. create seasonal displays)	2
	use historical materials (nature crafts)	2
	Trails	
	better identification of material on trail	3
	more trails needed	2
	other	1
	Guided walks with a naturalist (also building exhibit tours)	
	other	3
	Films	
	have better selection, and thus, quality to choose from	5
	preview the films	3
	other	2
	Library	
	keep it up-to-date	2
	obtain more books	2
	give it more publicity	2
	other	1
8	Unreached Segment of the Population	
	Handicapped	4
	Senior citizens	4
	Other	3

Appendix 48. Continued

Questionnaire number	Questionnaire item	Number of comments
--	What Needed to Reach the Above	
	Trails, buildings and programs need to be modified for the handicapped	3
	Advertise more often	2
	Public transportation to the nature center needed	2
	Other	2
9	Major Contribution of the Nature Center to the Community	
	It gets people involved in nature	4
	It is an information facility	2
	Other	2

Appendix 49. Categories of activities.

Sedentary	vs.	Active
Films		Self-guided nature trail
Exhibits		Guided walk
Library		Guided tour

Inside	vs.	Outside
Films		Self-guided nature trail
Exhibits		Guided walk
Library		
Guided tour		

Staff involvement	vs.	No staff involvement
Films		Exhibits
Guided walk		Library
Guided tour		Self-guided nature trail

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